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Geotechnical and Geologic Hazard Investigation

Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

IGES Project No. 01628-040

October 4, 2024

Prepared for:
Summit Mountain Holding Group

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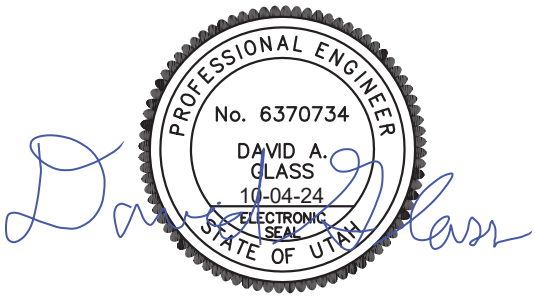

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1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical and geologic hazard investigation performed for the proposed Shelter Hill Development, part of the greater Powder Mountain Resort located in Weber County, Utah. Based on the literature reviewed and surficial and subsurface conditions encountered on the property, **it is our opinion that the property is suitable for development provided that the recommendations presented in this report are incorporated into the design and construction of the project**. A brief summary of our most pertinent findings, conclusions, and recommendations are presented in the following paragraphs:

- **The Shelter Hill project area appears to have a semi-localized shallow groundwater hazard that is capable of adversely impacting different parts of the development. Beyond the shallow groundwater hazard, no other geologic hazards have been identified that are currently considered capable of adversely impacting the proposed development.**

- Thirty-one exploration test pits were excavated at representative locations across the property to evaluate the subsurface materials and to assess the geologic conditions. The test pits were excavated to depths of between 8 and 11 feet below existing grade, with groundwater seepage encountered in 12 of the 31 test pits.

- In general, the subject property is mantled by between 1 and 2 feet of topsoil forming on a thin (less than 2-foot-thick) cobbly colluvium unit or weathered Wasatch Formation bedrock, which extended to the maximum depth of exploration in all the test pits. The colluvium unit was notably absent in the northernmost test pits. The Wasatch Formation in this area consists of loosely consolidated conglomerate bedrock that generally weathers and disaggregates into a moderate reddish brown to dark reddish brown to moderate reddish orange, clayey SAND with gravel (SC) grading to clayey GRAVEL with sand (GC), commonly with cobbles and boulders up to several feet in diameter. Thin to thick lenses and beds of sandy lean to fat CLAY (CL-CH) was also observed in some test pits.

- Shallow groundwater, as shallow as 4½ feet below the existing ground surface, was encountered in 12 of the 31 test pits. In a few of these test pits, the groundwater occurrence was a perched seepage that slowly filled the test pit, while in most of these test pits a steady flow of groundwater was encountered at a depth of between 7 and 8 feet below existing grade, which quickly filled the test pits. The shallow groundwater hazard risk is considered to be high in the area of

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these test pits (delineated as *shallow groundwater areas* on Figure A-5), and low to moderate for the rest of the property.

- Slope stability modeling indicates that the existing natural slopes associated with the subject property are stable under static and seismic conditions, and no evidence of landslide deposits was observed on the property in the aerial imagery review, site reconnaissance, or in the subsurface as a part of this investigation. Given this data, the subject property is not anticipated to be adversely impacted by landslide hazards. However, given the presence of shallow groundwater conditions and the proximity to steep slopes and mapped landslide deposits east of the eastern margin of the property, the landslide/mass-movement hazard risk is considered to be low to moderate for those lots along the eastern margin of the property, and low for the rest of the property.

- Earthquake ground shaking may potentially affect all parts of the project area, and is likely to be very strong to severe in the event of an earthquake along the Weber Segment of the Wasatch Fault Zone.

- Rockfall, debris-flow, flooding, surface-fault-rupture, and liquefaction hazard risk is considered to be low for the property.

Given the conclusions listed above, IGES makes the following recommendations:

- Given the presence of shallow groundwater conditions across much of the property, it is recommended that any structures that are to be constructed within the identified shallow groundwater areas on Figure A-5 be on-grade structures (e.g., without basements), unless groundwater remediation efforts are performed (e.g., installation of land drains). One option to mitigate the groundwater hazard is by way of the installation of basement foundation drains for all subterranean structures in these areas. Foundation drains should daylight (gravity feed) to a suitable location such as a storm drain or a natural surface drainage, if permitted. Barring this, the foundation drain should daylight to a chamber located below the lowest finish floor elevation, equipped with a redundant sump pump system. Land drains to drain the impacted areas are also an option; reduction of groundwater throughout the impacted area will also serve to improve slope stability.

- Slope stability modeling on a lot-by-lot basis should be performed for all lots that are adjacent to the eastern margin of the property (Lots 1-9 and 32-39, based on the most recent site plan) once final grading plans are developed for the lots. Such

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slope stability modeling may require additional subsurface investigation and laboratory testing to provide site-specific geologic conditions for a particular lot.

- An engineering geologist should observe and document the foundation excavations for proposed structures to assess whether the excavations have been taken to an appropriate depth and into suitable subsurface materials, to assess the subgrade preparation, and to further evaluate for adverse geologic conditions.

- Shallow spread or continuous wall footings constructed *entirely* on competent, uniform Wasatch Formation bedrock, or *entirely* on a minimum of 2 feet of granular structural fill, may be proportioned utilizing a maximum net allowable bearing pressure of **3,600 pounds per square foot (psf)** for dead load plus live load conditions. The net allowable bearing value presented above is for dead load plus live load conditions. The allowable bearing capacity may be increased by one-third for short-term loading (wind and seismic). The minimum recommended footing width is 20 inches for continuous wall footings and 30 inches for isolated spread footings.

- **This report has been prepared for our Client's exclusive use for the Shelter Hill project; use of this document by others is not authorized except by written permission of our Client**.

NOTICE: The executive summary is not intended to replace the information presented in the report, of which the executive summary is an essential part. The executive summary should not be used separately from the report and is only provided as an overview, to summarize the primary conclusions and recommendations. The executive summary may omit a number of details, any one of which could be crucial to the proper interpretation and application of the report and implementation of the recommendations.

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2.0 INTRODUCTION

2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical and geologic hazard investigation conducted for the proposed Shelter Hill Development, part of the greater Powder Mountain Resort located in Weber County, Utah. The purpose of our investigation was to assess the nature and engineering properties of the subsurface soils at the project site and to provide recommendations for the design and construction of foundations, grading, and drainage. In addition, geologic hazards have been assessed for the property. The scope of work completed for this study included literature review, site reconnaissance, subsurface exploration, laboratory testing, engineering analyses, and preparation of this report.

Our services were performed in accordance with our proposal dated June 7, 2024, and your signed authorization. The recommendations presented in this report are subject to the limitations presented in the "Limitations" section of this report (Section 7.1).

2.2 PROJECT DESCRIPTION

The project site is located south of the eastern extension of Summit Pass Road, part of the Powder Mountain Resort (see Figure A-1, *Site Vicinity Map*). The subject property is located in an area that is largely moderately to densely vegetated; various gravel roads and mountain bike trails crisscross different parts of the property (see Figure A-2, *Aerial Image*). The site straddles a northwest-trending topographic ridge, with slopes descending steeply to the east and gently to moderately to the west (see Figure A-3, *Slope Map*).

Our understanding of the project is based largely on the plan titled “Ph1 Village – CAD site Plan w/ Aerial” prepared by Hart Howerton, dated May 31, 2024. The subject property consists of approximately 51 acres situated along a northwest-southeast-trending ridge south of the existing Powder Mountain resort area. Current project plans show 19 smaller cabin lots, 12 medium-size single-family residential lots, and 14 larger (greater than 1 acre) custom home sites. The plans also show two skier bridges at the northern part of the site, ski runs, and a potential ski lift terminal. However, of primary importance to this study is the southern extension of Summit Pass Road, which will follow the ridgeline, approximately bisect the subject property, and provide access to all of the residential lots.

The project is in the early stages of development, and detailed grading plans have yet to be developed. Structures are anticipated to consist of both on-grade structures and structures with basements, founded on conventional spread footings.

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2.3 PREVIOUS WORK

The northwestern portion of the subject property was previously evaluated by IGES as part of a geotechnical and geologic hazard study for The Village Mixed-Use Development area (IGES, 2023). Test pits V-TP-11 through V-TP-19 from the IGES (2023) study were excavated across the current Shelter Hill area in the study (see Figure A-2). A discussion of the findings from the study is provided in Section 4.2 of this report.

Similarly, a portion of the property along the west-central margin of the property was previously evaluated by IGES as part of a geotechnical and geologic hazard study for a parcel formerly known as The Beach Club (IGES, 2017). Three test pits (BC-TP-1 through BC-TP-3) were excavated as part of the study (see Figure A-2), and a discussion of the findings from the study is provided in Section 4.2 of this report.

Test pit logs and laboratory test data from these previous studies have been incorporated into this study.

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3.0 METHODS OF STUDY

3.1 LITERATURE REVIEW

3.1.1 Geotechnical

IGES completed a geotechnical investigation for the Powder Mountain Resort expansion in 2012 (2012a, 2012b). Our previous work included twenty-two test pits and one soil boring excavated at various locations across the 200-acre development; as a part of this current study, the logs from relevant nearby test pits and other data from our reports were reviewed. In addition, Western Geologic (2012) completed a geologic hazard study for the greater 200-acre Powder Mountain expansion project – this report was reviewed to assess the potential impact of geologic hazards within the project area.

As noted above, IGES has performed a number of geotechnical and geologic hazard investigations across the greater Powder Mountain expansion project area. Two of these projects adjoin or are contained within the subject property, including studies for the *Village Mixed-Use Development (*to the north; IGES, 2023), and *The Beach Club* (within the current Lots 13-15; IGES, 2017). These reports provide the nearest subsurface data to the project site. The pertinent test pit logs, conclusions, and recommendations from these studies were reviewed.

3.1.2 Geological

Several pertinent publications were reviewed as part of this assessment. This includes, but is not limited to, the following documents:

- Anderson, et al. (2023) provides 1:24,000 scale geologic mapping of the Brown's Hole 7.5-Minute Quadrangle (see Figure A-4, *Regional Geology Map*).
- Western Geologic (2012) conducted a reconnaissance-level geologic hazard study for the greater 200-acre Powder Mountain expansion project, including the northern portion of the project area. The Western Geologic (2012) study modified some of the potential landslide hazard boundaries that had previously been mapped at a regional scale (1:100,000) by Coogan and King (2001) and Elliott and Harty (2010).
- Coogan and King (2016) provides other recent geologic mapping of the project area at a more regional (1:62,500) scale.
- The corresponding United States Geological Survey (USGS) topographic map for the Brown's Hole 7.5-Minute Quadrangle (2023; see Figure A-1) provides physiographic and hydrologic data for the project area.
- Regional-scale geologic hazard maps pertaining to landslides (Elliott and Harty, 2010; Colton, 1991), faults (USGS and Utah Geological Survey (UGS), 2006), and

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liquefaction (Christenson and Shaw, 2008; Anderson et al., 1994) that cover the project area were also reviewed.

- The Quaternary Fault and Fold Database (USGS and UGS, 2006), was reviewed to identify the location of proximal faults that have had associated Quaternary-aged displacement.
- A site-specific geologic hazards assessment for the subject property was produced from the UGS Hazards Portal and reviewed (UGS, 2024a).

Stereo-paired aerial imagery for the project site taken from the UGS Aerial Imagery Collection (UGS, 2024b), recent and historic Google Earth imagery, and available lidar imagery was also reviewed to assist in the identification of potential adverse geologic conditions. The aerial photographs reviewed are documented in the *References* section of this report (Section 8.0).

3.2 SITE RECONNAISSANCE

A team of IGES engineering geologists conducted site reconnaissance and site-specific geologic mapping of the subject property and surrounding areas on June 17th and 18th, 2024. The site reconnaissance was performed to evaluate the geologic conditions at the property, to field-verify features and/or potential geologic hazard areas identified in the literature and aerial imagery review, to map the local geology across the subject property, and to identify any existing geologic hazards associated with the property that need further evaluation with subsurface explorations. During our site reconnaissance the locations of the proposed test pits for the subsequent subsurface investigation were identified and staked. Figure A-5 is a *Geotechnical and Local Geology Map*, which displays the local geology based upon the results of the field mapping and subsurface explorations described in the following sections.

3.3 SUBSURFACE INVESTIGATION

Subsurface conditions were investigated by IGES through the excavation of 31 exploration test pits (TP-1 through TP-31) completed at representative locations across the property between June 24 and July 3, 2024. The approximate locations of the test pits are illustrated on Figures A-2, A-3, and A-5.

The test pits were excavated with the aid of a Caterpillar 320E track-mounted excavator with a 3-foot bucket to depths of between 8 and 11 feet below existing grade; the test pits were between 23 and 37 feet long. The soil types were visually logged at the time of our field work in general accordance with the *Unified Soil Classification System* (USCS). Soil classifications and descriptions are included on the test pit logs (Figures A-6 through A-37). Pertinent test pit logs from the IGES (2023) study have been included as Figures A-

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37 through A-46, and test pit logs from the IGES (2017) study have been included as Figures A-47 through A-49. A key to USCS symbols and terminology is included as Figure A-50. Select site and test pit photos are displayed in Figure A-51. A complete photographic record is available upon request. Upon completion of the logging of the test pits, the excavations were backfilled without engineering quality controls. The excavations were re-graded as close to original grade as possible.

Representative soil samples were collected from the test pits. Samples included bulk soil samples and relatively undisturbed soil samples were collected with the use of a 6-inch-long brass tube attached to a hand sampler driven with a 2-lb sledgehammer.

3.4 LABORATORY TESTING

Samples retrieved during the subsurface investigation were transported to the IGES laboratory for evaluation of engineering properties. Specific laboratory tests included:

- In Situ Moisture Content and Dry Unit Weight (ASTM D7263 and D2216)
- Fines Content (ASTM D1140)
- Grain Size Distribution (ASTM D6913)
- Atterberg Limits (ASTM D4318)
- Modified Proctor (ASTM D1557)
- California Bearing Ratio (CBR) (ASTM D1883)
- Unconsolidated-Undrained Triaxial Compression (ASTM D2850)
- Direct Shear (ASTM D3080)

Results of the laboratory testing are discussed in this report and presented in Appendix B. Some test results, including moisture content, gradation, and Atterberg Limits, have been incorporated into the test pit logs (Figures A-6 through A-37).

In addition, relevant laboratory testing completed on earth materials within the project boundaries for earlier projects have been reviewed.

3.5 SLOPE STABILITY MODELING

Utilizing the subsurface and laboratory data gathered from this investigation, four representative geologic cross-sections (Sections A-A’ through D-D’) were developed to assess the stability of the prominent descending slopes on the western and eastern reaches of the property. The location of the cross-sections are shown in plan-view on Figures A-3 and A-5 and the respective geologic cross-sections are presented on Figures D-1 through D-4 in Appendix D. The results of the slope stability modeling are found in Appendix D and are discussed in detail in Section 5.0 of this report.

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4.0 FINDINGS

4.1 GENERAL GEOLOGIC SETTING

4.1.1 Regional Geology

The project area is situated in the western portion of the northern Wasatch Mountains, approximately 4 miles north of Ogden Valley. Ogden Valley separates the western part of the Wasatch Range from the Bear River Range to the east, a subgroup of mountains that are part of the parent Wasatch Range. The Wasatch Mountains contain a broad depositional history of thick Precambrian and Paleozoic sediments that have been subsequently modified by various tectonic episodes that have included thrusting, folding, intrusion, and volcanics, as well as scouring by glacial and fluvial processes (Stokes, 1987). The uplift of the Wasatch Mountains occurred relatively recently during the Late Tertiary Period (Miocene Epoch) between 12 and 17 million years ago (Milligan, 2000).

The Wasatch Mountains, as part of the Middle Rocky Mountains Province (Milligan, 2000), were uplifted as a fault block along the Wasatch Fault (Hintze, 1988). Ogden Valley itself is a fault-bounded trough that has been partially filled by Tertiary-aged sediments (Wasatch Formation) and volcaniclastic rocks (Norwood Formation), and was occupied by Lake Bonneville until the Bonneville Flood and subsequent lake-level drop to the Provo Shoreline around 18,000 years ago (Oviatt, 2015). The valley was later cut through by the Ogden River and subsequently dammed to form Pineview Reservoir.

4.1.2 Seismotectonic Setting

The Wasatch Fault and its associated segments are part of an approximately 230-mile-long zone of active normal faulting referred to as the Wasatch Fault Zone (WFZ), which has well-documented evidence of late Pleistocene and Holocene (though not historic) movement (Lund, 1990; Hintze, 1988). The faults associated with the WFZ are all normal faults, exhibiting block movement down to the west of the fault and up to the east. The WFZ is contained within a greater area of active seismic activity known as the Intermountain Seismic Belt (ISB), which runs approximately north-south from northwestern Montana, along the Wasatch Front of Utah, through southern Nevada, and into northern Arizona. In terms of earthquake risk and potential associated damage, the ISB ranks only second in North America to the San Andreas Fault Zone in California (Stokes, 1987).

The WFZ consists of a series of ten segments of the Wasatch Fault that each display unique characteristics and are likely to have ruptured independent of one another (Wong et al., 2016). The subject property is located approximately 10.3 miles northeast of the

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Weber Segment of the Wasatch Fault, which trends north-south along the Wasatch Front and represents the closest documented Holocene-aged (active) fault to the subject property (USGS and UGS, 2006).

4.2 SURFICIAL GEOLOGY FROM LITERATURE

4.2.1 Published Literature

Coogan and King (2016) map the property to be entirely underlain by Wasatch Formation bedrock, with nearby bedding attitudes indicating the bedrock to be striking north-northeast and dipping at between 3 and 5 degrees to the east-southeast. Two lobes of glacial moraine deposits are mapped east of the northern half of the property, while a lobe of undivided landslide and colluvial deposits is mapped east of the southern portion of the property.

Most recently, Anderson, et al. (2023; see Figure A-4) map the property to be almost entirely underlain by Wasatch Formation bedrock (map unit Tw), though the southwestern portion of the property is mapped as the upper reaches of a large lobe of colluvium (map unit Qc). Consistent with Coogan and King (2016), two lobes of glacial deposits (map units Qgp and Qgmp) are mapped east of the northern half of the property, and undivided landslide and colluvial deposits (map unit Qmc) glacial deposits (map unit Qmp) are mapped east of the southern portion of the property. Notably, two large glacial cirques[1] (shown as hachured blue semi-circles) are mapped immediately east of the eastern margin of the property and above the mapped glacial and landslide deposits.

The Wasatch Formation (map unit Tw) is described as an Eocene to Paleocene-aged "Moderate reddish-orange to pale yellowish-orange, cobble to boulder conglomerate with varying amounts of mudstone and sandstone; forms cobble- and boulder-strewn slopes but does not crop out; unconsolidated to consolidated claystone, sandstone, limestone, and dolomite reported in lithologic logs from water wells… clasts are tan, gray, purple, and green quartzite and well-indurated sandstone…deposited over considerable paleotopography…0 to over 2000 feet (0-610+ m) thick" (Anderson et al., 2023).

The colluvial deposits (map unit Qc) are described as Holocene to Late Pleistocene?-aged "Poorly sorted silt, sand, gravel, clay, cobbles, and boulders; angular to subangular clasts; rounded clasts derived from Tertiary Wasatch Formation (Tw) are common; massive to poorly bedded; composition depends on local bedrock source; mapped on moderate to

[1] **Cirque**: A deep steep-walled half-bowl-like recess or hollow, variously described as horseshoe- or crescent-shaped or semicircular in plan, situated high on the side of a mountain and commonly at the head of a glacial valley, and produced by the erosive activity of a mountain glacier. It often contains a small round lake, and it may or may not be occupied by ice or snow (AGI, 2005).

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steep slopes; includes slope-wash and soil creep deposits and may include local mass-movement and talus deposits; includes residual deposits developed on Wasatch Formation; 6 to 50 feet (2 – 15 m) thick" (Anderson et al., 2023).

The undivided landslide and colluvial deposits (map unit Qmc) are described as Holocene and Pleistocene-aged "Poorly sorted to unsorted clay- to boulder-sized material; mapped where landslide deposits are difficult to distinguish from colluvium (slopewash and soil creep) and where mapping separate, small, intermingled areas of landslide and colluvial deposits is not possible at map scale; locally includes talus and debris flow and flood deposits; typically mapped where landslides are thin ("shallow"); also mapped where the blocky or rumpled morphology that is characteristic of landslides has been diminished ("smoothed") by slopewash and soil creep; composition depends on local sources; 6 to 40 feet (2-12 m) thick. These deposits are as unstable as other landslide units (Qms, Qmsy, Qmso)" (Anderson et al., 2023).

The glacial moraine till of Pinedale age (map unit Qgmp) is described as Late Pleistocene-aged "Till of ground, end, recessional, and lateral moraines; till is non-stratified, poorly sorted clay- to boulder-size sediment, primarily derived from rounded cobbles and boulders of the Wasatch Formation; includes rare angular clasts locally derived from Cambrian units; mapped moraines have poorly to moderately developed soil and moderate moraine morphology…estimated thickness up to 120 feet (35 m)" (Anderson et al., 2023).

The undivided glacial deposits of Pinedale age (map unit Qgp) is described as Late Pleistocene-aged "Non-stratified, poorly sorted clay- to boulder-sized sediment; glacial till and a component of outwash; primarily derived from rounded cobbles and boulders of Wasatch Formation (Tw); rare angular clasts derived from local Cambrian units; mapped as undivided glacial deposits because deposits lack distinct geomorphic shapes of end, recessional, and lateral moraines…estimated thickness up to 50 feet (15 m)" (Anderson et al., 2023).

4.2.2 Site-Specific Studies

In the IGES (2023) *Village Mixed-Use Development* study, test pits V-TP-11 through V-TP-19 were excavated across the northern end of the Shelter Hill subject property. These test pits all encountered clast-rich and generally coarse-grained weathered Wasatch Formation bedrock in the subsurface and extending to the maximum depth of exploration in the test pits. The bedrock was overlain by up to 2½ feet of topsoil or undocumented fill. A thin veneer of colluvium was observed in V-TP-15. Groundwater was not encountered in any of the test pits.

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In the IGES (2017) *The Beach Club* study, test pits BC-TP-1 through BC-TP-3 were excavated across the current Lots 13-15 of the Shelter Hill subject property. These test pits all encountered interbedded clay-rich and sand- and gravel-rich weathered Wasatch Formation bedrock in the subsurface and extending to the maximum depth of exploration in the test pits, though possible weathered Nounan Dolomite bedrock was observed in the base of BC-TP-2 and BC-TP-3. The bedrock was overlain by up to 2 feet of topsoil and colluvium up to 3 feet thick. Groundwater seepage was encountered at a depth of 5½ feet below existing grade in BC-TP-1, but was not encountered in the other test pits.

4.3 HYDROLOGY

The USGS 7.5-minute topographic map for the Brown's Hole Quadrangles (2023; see Figure A-1) indicates that the project area is situated on a topographic high, with steep slopes descending to the northeast. No active or intermittent drainages are shown to be passing through the property, and no drainages were observed on the property during the site reconnaissance. An unnamed, northeast-trending drainage located approximately ¼-mile east of the southeastern margin of the property was observed to be flowing with water at the time of the site reconnaissance.

The FEMA flood map that covers the project area was not printed due to the entire region covered in the map as being located in Zone X, corresponding to being located outside of the 500-year flood floodplain for any nearby drainage (FEMA, 2015).

Baseline groundwater depths for the project area are currently unknown, but are anticipated to fluctuate both seasonally and annually. No springs are mapped on the property, though hydrophilic vegetation indicative of shallow groundwater conditions was observed in several areas across the property during the site reconnaissance. Groundwater was encountered in 12 of the 31 test pits excavated for this study at depths of between 4½ and 8 feet below existing grade. Groundwater was also encountered at a depth of 5½ feet below existing grade in BC-TP-1. The groundwater occurrences were found to be clustered in three shallow groundwater areas, identified in Figure A-5.

4.4 GEOLOGIC HAZARDS FROM LITERATURE

Based upon the available geologic literature, regional-scale geologic hazard maps that cover the project area have been produced for landslide, fault, debris-flow, and liquefaction hazards. The following is a summary of the data presented in these regional geologic hazard maps as well as other source data.

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4.4.1 Landslides

Two regional-scale landslide hazard maps have been produced that cover the project area. Colton (1991) maps several landslide deposits located near the project area, including a northwest-trending landslide lobe adjacent to the northwestern portion of the property and two east-trending landslide lobes adjacent to the eastern margin of the property. Elliott and Harty (2010) map the same deposits as Colton (1991), but identify these deposits as "landslide undifferentiated from talus, colluvial, rock-fall, glacial, and soil-creep deposits." Western Geologic (2012) map a Pleistocene landslide deposit lobe adjacent to the northwestern margin of the property, but the mapped area for that study does not include the southern half of the subject property. Both Coogan and King (2016) and Anderson et al. (2023) map undivided landslide and colluvial deposits (Qmc) downslope and east of the eastern margin of the property in the southern portion of the property (see Figure A-4).

More site-specifically, the IGES (2023) *The Village Mixed-Use Development* test pits excavated in the northern end of the property did not encounter any landslide deposits. The IGES (2017) *The Beach Club* test pits encountered possible shallow soil creep within the uppermost several feet of the subsurface, though no geomorphic expression of landsliding was present on the surface.

4.4.2 Faults

The Quaternary Fault and Fold Database of the United States (USGS and UGS, 2006) does not show any Quaternary-aged (~2.6 million years ago to the present) faults to be present on or projecting towards the project area. The Weber County Natural Hazards Overlay Districts defines an active fault to be "a fault displaying evidence of greater than four inches of displacement along one or more of its traces during Holocene time (about 11,000 years ago to the present)" (Weber County, 2015). The closest mapped active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 10.3 miles southwest of the western margin of the project area (USGS and UGS, 2006).

4.4.3 Debris Flows

Elliott and Harty (2010) do not indicate any debris-flow paths on or near the property, and Anderson et al. (2023) do not map any young alluvial fan deposits on the property.

4.4.4 Liquefaction

Anderson, et al. (1994) and Christensen and Shaw (2008) both show the project area to be located in an area designated as having a *very low* potential for liquefaction.

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4.5 REVIEW OF AERIAL IMAGERY

A series of aerial photographs that cover the project area were taken from the UGS Aerial Imagery Collection (UGS, 2024b) and analyzed stereoscopically for the presence of adverse geologic conditions across the property. This included a review of photos collected from the years 1946, 1952, and 1963. A table displaying the details of the aerial photographs reviewed can be found in the *References* section at the end of this report.

No geologic lineaments, fault scarps, landslide headscarps, or landslide deposits were observed in the aerial photography on the subject property. However, the two bowl-shaped cirques mapped just east of the eastern margin of the property in the southern half of the property were readily evident in the imagery.

Google Earth imagery of the property from between the years of 1993 and 2024 were also reviewed. No landslides or other geological hazard features were noted on the property in the imagery. In the 1993 imagery, the property and surrounding areas remained largely unmodified from natural conditions, and included abundant vegetation. However, a dirt road (Dutch John Way) was observed to pass to the south through the property, and two mountain bike trails are also present through other parts of the property. By 2014, construction of paved roads throughout the Summit Powder Mountain Resort had begun, including Summit Pass Road, Copper Crest Road, and Spring Park Road to the north. Between 2014 and 2024, the northern end of the subject property was observed to be used for parking and temporary storage of various construction materials.

Utah Geological Survey (UGS) 2015-2017 State of Utah lidar data that covers the project area was also reviewed. No evidence of landslides was observed within the property boundaries. However, a small landslide lobe was observed downslope and east of the property near Lots 1 and 2 (the mapped Qmc area on Figure A-5). Additionally, irregular, hummocky topography was observed within the southern cirque in the area mapped by Anderson et al. (2023) as undivided landslide and colluvial deposits (Qmc on Figure A-4).

4.6 LOCAL GEOLOGY FROM SITE RECONNAISSANCE

IGES conducted reconnaissance of the site and the immediate adjacent properties on June 17 and 18, 2024. The site reconnaissance was conducted with the intent to assess the general geologic conditions present across the property, with specific interest in those areas identified in the geologic literature and aerial imagery reviews as potential geologic hazard areas. Additionally, the site reconnaissance provided the opportunity to geologically map the surficial geology of the area. Figure A-5 is a site-specific, local geologic map of the project area and adjacent areas.

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At the time of the site reconnaissance, the property was observed as a broad northwest-southeast trending topographic ridge that sloped gently to moderately downhill to the west, and steeply to the east. The ground surface was found to be largely flat-lying or gently sloping, but was uneven in some places. The northern half of the property was mainly covered by low-lying shrubs, bushes, and grass, with occasional moderate to dense patches of mature aspens and pine trees. The southern half of the property was generally densely covered with mature aspen and pine trees. Surficial soils at the site were observed to consist of moderate reddish brown silty to clayey sand with gravel, with common subrounded to subangular quartzite cobbles commonly equal to or less than 1 foot in diameter. Larger clasts up to 3½ feet in diameter were observed at the surface across the property. In general, the site appeared to be underlain by weathered Wasatch Formation bedrock, consistent with the mapping of Anderson et al. (2023).

Approximately ⅓-mile east of the southern end of the eastern margin of the property, an outcrop of the Upper Member of the Geertsen Canyon Quartzite (map unit Cgcu on Figure A-4) was observed. This bedrock unit was observed to be a dark yellowish orange to light gray granular quartzite and pebbly conglomerate that was very hard, thin to medium bedded, with silica and iron oxide cement and common iron oxide and manganese oxidation bands. The unit was measured to strike at S61°W (241°) and dip at 29° NW, largely consistent with the mapping of the outcrop shown in Anderson et al. (2023).

The two mapped large glacial cirques located immediately east of the eastern margin of the property were confirmed to be glacial features rather than landslide headscarps, as no evidence of slope instability was observed in association with these features. The headwall of the cirques were observed to expose Wasatch Formation consisting of clayey sand with gravel, and as much as a foot of topsoil had formed despite the slopes being measured to be between 25° and 30° down to the northeast. Downslope (northeast) of the cirques, strong soil creep was observed in the tree trunks and some irregular downslope topography indicated the possibility of some localized slumping.

Approximately 140 feet east of the eastern margin of Lots 1 and 2, a distinct landslide headscarp and associated hummocky topography indicative of landslide deposits were observed to extend downslope to a small sag pond at the base of the slope (see the mapped Qmc area on Figure A-5). The headscarp exposed abundant quartzite cobbles and boulders at the surface.

No springs, seeps, or running water were observed on the property at the time of the site reconnaissance. However, an unnamed northeast-flowing drainage approximately ¼-mile east of the southern end of the property was observed to be flowing with water at the time of the site reconnaissance. Hydrophilic vegetation (primarily Mule's Ear) was

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observed in several areas across the property, though no standing water was present. No surface expression of landslides or other geologic hazards was observed on the property during the site reconnaissance.

4.7 LOCAL GEOLOGY FROM SUBSURFACE INVESTIGATION

Between June 24 and July 3, 2024, 31 test pits (TP-1 through TP-31) were excavated at representative locations across the project area (see Figures A-2, A-3, and A-5). Detailed test pit logs are presented as Figures A-6 through A-37, and select test pit photos are presented in Figure A-51.

Three distinct geologic units were encountered in the subsurface, including topsoil, colluvium, and highly weathered Wasatch Formation bedrock. The soil and moisture conditions encountered during our investigation are discussed in the following paragraphs.

4.7.1 Earth Materials

A/B Soil Horizon: This topsoil unit was found to be present in all test pits, measured to be between 1 and 3 feet thick. Commonly, this unit was poorly developed and often difficult to distinguish from the underlying colluvium unit upon which the topsoil had formed. In general, the unit was observed to be a grayish brown to dark yellowish brown to brownish black, medium stiff, dry, sandy lean CLAY with gravel (CL) and clayey SAND with gravel (SC). Gravel and larger-sized subrounded to subangular quartzite clasts were generally between approximately 10% and 60% of the unit, and were up to 2 feet in diameter, though most commonly 1 to 2 inches in diameter. This unit contained an abundance of plant and tree roots.

Colluvium (Qc): This unit was observed to be undifferentiated from the topsoil in TP-4, TP-6 through TP-18, TP-20, TP-21, TP-22, and TP-30, and differentiated from the topsoil in TP-27 and TP-31. The unit was observed to be between 1 foot and 2½ feet thick where differentiated, and up to 3 feet thick where undifferentiated. In general, the unit was found to be a moderate yellowish brown to brownish gray, medium dense, dry, clayey GRAVEL with sand (GC) gradational to clayey SAND with gravel (SC). Gravel and larger-sized subrounded to subangular quartzite clasts comprised between approximately 20% and 60% of the unit and were up to 1½ feet in diameter, though most commonly 2 to 6 inches in diameter. The unit was commonly identified by the presence of a stone line at the basal contact of the unit.

Wasatch Formation (Tw): This unit was encountered and extended to the maximum depth of exploration in all 31 test pits, being at least 8 feet thick. The unit generally consisted of

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highly weathered, loosely consolidated conglomerate, sandstone, and mudstone bedrock that had disaggregated to several distinct, interbedded subunits. In general, the unit consisted of a moderate reddish brown to dark reddish brown to moderate reddish orange, dense to medium dense to loose, moist to wet, massive to weakly bedded clayey SAND with gravel (SC) interbedded with clayey GRAVEL with sand (GC) and sandy lean to fat CLAY (CL-CH). Gravel and larger-sized subrounded to subangular quartzite clasts comprised between approximately 30% and 70% of the unit, with individual clasts up to 2 feet in diameter, though the mode clast size was 2 to 4 inches in diameter in a wide range of clast sizes. Clay-rich interbeds were commonly devoid of clasts, however.

4.7.2 Groundwater

Groundwater was present in 12 of the 31 test pits excavated for this study, encountered between the depths of 4½ and 8 feet below existing grade. Table 4.7.2 on the following page is a summary table of the geologic conditions encountered in these test pits.

Table 4.7.2
Shelter Hill Test Pit Summary

Test Pit	Total Depth (ft)	Groundwater Depth (ft)	>1 ft. of Clay Present?	Test Pit	Total Depth (ft)	Groundwater Depth (ft)	>1 ft. of Clay Present?
TP-1	8½	N/A	No	TP-17	8½	N/A	No
TP-2	9	N/A	No	TP-18	9	7	Yes
TP-3	10	N/A	Yes	TP-19	9½	4½	No
TP-4	8	N/A	No	TP-20	9	7	Yes
TP-5	8	5½	No	TP-21	9	7	Yes
TP-6	8	N/A	No	TP-22	9½	N/A	Yes
TP-7	10	7	Yes	TP-23	9	8	No
TP-8	9	5½	Yes	TP-24	8½	N/A	Yes
TP-9	11	N/A	Yes	TP-25	9	N/A	No
TP-10	9½	N/A	Yes	TP-26	8½	N/A	Yes
TP-11	10	N/A	Yes	TP-27	8	N/A	Yes
TP-12	8½	N/A	Yes	TP-28	9½	7	No
TP-13	9½	N/A	Yes	TP-29	9½	7	No
TP-14	9	N/A	No	TP-30	9	5	No
TP-15	8½	N/A	No	TP-31	9	4½	No
TP-16	9½	N/A	No				

4.8 SEISMICITY

Following the criteria outlined in the 2021 International Building Code (IBC, 2021), which references ASCE-7-16, spectral response at the site was evaluated for the risk-targeted *Maximum Considered Earthquake* (MCE_R), which represents the spectral response accelerations in the direction of maximum horizontal response represented by a 5%

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damped acceleration response spectrum that equates to a 1% probability of building collapse within a 50-year period. The MCE_R spectral accelerations were determined based on the location of the site using the *ASCE-7 Hazard Tool*; this software incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey. These maps have been incorporated into the *International Building Code* (IBC) (International Code Council, 2021).

To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and *Site Class* are used. Site Class is a parameter that accounts for site amplification effects of soft soils and is based on the average shear wave velocity of the upper 100 feet (30 meters, Vs_{30}); site classifications are identified in Table 4.8a.

Table 4.8a
Site Class Categories

Site Class	Earth Materials	Shear Wave Velocity Range (Vs_{30}) m/s
A	Hard Rock	>1,500
B	Rock	760-1,500
C	Very Dense Soil/Soft Rock	360-760
D	Stiff Soil	180-360
E	Soft Soil	<180
F	Special Soils Requiring Site-Specific Evaluation (e.g., liquefiable)	n/a

Based on our field exploration and understanding of the geology in this area, the site is underlain by weathered Wasatch Formation bedrock, and would likely classify as Site Class B or possibly C. However, lacking site-specific shear wave velocity measurements, IBC requires a conservative approach, thus Site Class C has been assumed (very dense soil or soft rock). Based on the Site Class C site coefficients, the short- and long-period *Design Spectral Response Accelerations* are presented in Table 4.8b. For geotechnical practice, the geo-mean peak ground acceleration (PGA_M)[2] is presented in Table 4.8c.

[2] The PGA_M is based on a uniform hazard approach and represents the probabilistic PGA with a 2% probability of exceedance in a 50-year period (2PE50) (as opposed to the risk-targeted MCE_R, which is based on a uniform risk approach).

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Table 4.8b
Spectral Accelerations for MCE_R, Risk-Targeted Values (Structural)

Mapped B/C Boundary S_a (g)		Site Coefficient (Site Class C)		Design Sa (g)	
Ss	S_1	F_a	F_v	S_{DS}	S_{D1}
0.793	0.273	1.2	1.5	0.634	0.273

1) T_L=8

Table 4.8c
Spectral Accelerations for MCE, Geo-Mean (2PE50) Values (Geotechnical)

Mapped B/C Boundary PGA (g)	Site Coefficient F_{PGA} (Site Class C)	PGA_M (g)
0.345	1.2	0.414

4.9 GEOLOGIC HAZARD ASSESSMENT

Geologic hazard assessments are necessary to determine the potential risk associated with particular geologic hazards that are capable of adversely affecting a proposed development area. As such, they are essential in evaluating the suitability of an area for development and provide critical data in both the planning and design stages of a proposed development. The geologic hazard assessment discussion below is based upon a qualitative assessment of the risk associated with a particular geologic hazard, based upon the data reviewed and collected as part of this investigation.

A “low” hazard rating is an indication that the hazard is either absent, is present in such a remote possibility so as to pose limited or little risk, or is not anticipated to impact the project in an adverse way. Areas with a low-risk determination for a particular geologic hazard do not require additional site-specific studies or associated mitigation practices with regard to the geologic hazard in question.

A “moderate” hazard rating is an Indication that the hazard has the capability of adversely affecting the project at least in part, and that the conditions necessary for the geologic hazard are present in a significant, though not abundant, manner. Areas with a moderate-risk determination for a particular geologic hazard may require additional site-specific studies, depending on location and construction specifics, as well as associated mitigation practices in the areas that have been identified as the most prone to susceptibility to the particular geologic hazard.

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A “high” hazard rating is an indication that the hazard is very capable of or currently does adversely affect the project, that the geologic conditions pertaining to the particular hazard are present in abundance, and/or that there is geologic evidence of the hazard having occurred at the area in the historic or geologic past. Areas with a high-risk determination always require additional site-specific hazard investigations and associated mitigation practices where the location and construction specifics are directly impacted by the hazard. For areas with a high-risk geologic hazard, simple avoidance is often considered.

The following is a summary of the geologic hazard assessment for the project site.

4.9.1 Landslide/Mass-Movement

The subject property does not have landslide deposits mapped on any part of the property (Elliott and Harty, 2010; Western Geologic, 2012; Coogan and King 2016; Anderson et al., 2023), though undivided landslide deposits and colluvium have been mapped adjacent to the eastern margin of the southern end of the property (see Figure A-4). Evidence of landsliding was not observed on the property in the aerial imagery review, site reconnaissance, or in the subsurface as part of this investigation. Notably, a landslide headscarp and associated landslide deposits were observed approximately 140 feet east of the eastern margin of the property near Lots 1 and 2 (see Figure A-5).

Slope stability modeling performed as part of this investigation demonstrates that natural slopes will be stable under static and seismic conditions (see Section 5.0). Given this data, the subject property is not anticipated to be adversely impacted by landslide hazards. However, given the presence of shallow groundwater conditions and the proximity to steep slopes and mapped landslides, the landslide/mass-movement hazard risk is considered to be low to moderate for the lots along the eastern margin of the property (the steepest part of the property), and low for the rest of the property.

4.9.2 Rockfall

The subject property is on a topographic high, and no bedrock outcrops are exposed upslope of the property. As such, the rockfall hazard risk associated with the property is considered to be low.

4.9.3 Debris-Flows and Flooding

Debris-flows typically deposit on existing alluvial fans located at the mouth of active canyons, while flooding typically occurs in drainage channels and lowland areas within a drainage basin. Anderson et al. (2024) does not map any young alluvial fans on the subject property, nor were young alluvial fan deposits observed during the site reconnaissance

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or subsurface investigation. Given this information, the debris-flow hazard risk is considered to be low for the property.

The property is located on a topographic high, and no drainages are present on or adjacent to the property. Given this data, the flood hazard risk is considered to be low.

4.9.4 Surface-Fault Rupture and Earthquake-Related Hazards

No faults are known to be present on or project across the property, and the closest active fault to the property is the Weber Segment of the Wasatch Fault Zone, located approximately 10.3 miles to the southwest of the property (USGS and UGS, 2006). Given this information, the risk associated with surface-fault-rupture on the property is considered low.

The entire property is subject to earthquake-related ground shaking from a large earthquake generated along the active Wasatch Fault. Given the distance from the Wasatch Fault, the hazard associated with ground shaking is considered to be very strong to severe (UGS, 2024a). Proper building design according to appropriate building code and design parameters can assist in mitigating the hazard associated with earthquake ground shaking.

4.9.5 Liquefaction

Soil liquefaction results from loss of strength due to the rapid buildup of pore water pressure during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction are clean, loose, saturated, and uniformly graded sand below the water table, whereas earth materials consisting of cohesive clay, dense sand/gravel, and bedrock are generally considered not susceptible to liquefaction. Effects of liquefaction can include surficial sand boils, settlement, bearing capacity failures, and lateral spreading.

Though shallow groundwater was observed in some places, the site is underlain by Wasatch Formation conglomeratic bedrock, a weathered but still largely competent sedimentary rock unit that is anticipated to increase in competency with depth. Rock units such as these are not considered susceptible to liquefaction. As such, and consistent with the published literature, the potential for liquefaction occurring at the site is considered low.

4.9.6 Shallow Groundwater

Groundwater was encountered in 12 of the 31 test pits excavated across the property (see Table 4.7.2), concentrated within three distinct areas (see the identified shallow groundwater areas on Figure A-5). Additionally, groundwater was observed in test pit BC-

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TP-1 (IGES, 2017) and hydrophilic vegetation was observed in several places across the site. The test pits were excavated in late June and early July, and the groundwater level was likely to be at or near its peak levels following spring snowmelt and runoff.

Given the absence of groundwater in test pits excavated between the three shallow groundwater areas, it is interpreted that there is not a consistent hydrologic connection between the three shallow groundwater areas, but rather each is likely to be fed by its own individual source area. Additionally, these appear to be perched conditions and are not considered to represent a regional potentiometric surface. Nevertheless, given the existing data, it is expected that groundwater levels will fluctuate both seasonally and annually, and the risk associated with shallow groundwater hazards is considered to be high in the area of these test pit (delineated as shallow groundwater areas on Figure A-5), and low to moderate for the rest of the property.

Spring thaw and runoff are likely to significantly contribute to elevated groundwater conditions (localized perched conditions). Shallow groundwater issues can be mitigated through appropriate grading measures and/or the avoidance of the construction of basement levels, or constructing basements with foundation drains. Land drains to draw down the groundwater over a wide area may also be a feasible option.

4.10 SUBSURFACE CONDITIONS (GEOTECHNICAL)

4.10.1 Strength of Earth Materials

Selected samples of the prevailing earth materials (weathered Wasatch Formation) have been tested in our soil laboratory to assess inherent soil strength. Four representative samples were tested by way of a Direct Shear test (ASTM D3080) under drained conditions; the test specimens were too coarse for testing in an oedometer, thus the samples tested were remolded to 94% of the maximum dry density per ASTM 1557 (modified Proctor). The test results are summarized in Table 4.10.1, detailed test results are presented in Appendix B.

Five relatively ‘undisturbed’ tube samples of the Wasatch Formation were tested under unconsolidated-undrained conditions by way of a triaxial compression test (ASTM D2850). The test provides the shear stress at failure, which approximates undrained shear strength (S_u). The test results are summarized in Table 4.10.1, and detailed test results are presented in Appendix B. These test results are likely more representative of the clay-rich portion of the Wasatch Formation.

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Table 4.10.1
Summary of Laboratory Strength Testing

Sample Location	Depth (ft.)	USCS Classification	Moist Unit Weight (Y_m) (pcf)	Friction Angle (ϕ) (deg.)	Cohesion (c) (psf)	Index Properties
TP-5	4.5	GC	129.2	33	558	G:44.9% S:30.1% F:25.0%
TP-9	9.0	CL	129.3	31	591	LL:44, PI:30; G:6.8% S:41.9% F:51.3%
TP-25	6.5	GC-GM	130.6	33	708	LL:25, PI:6; G:53.8% S:26.6% F:19.7%
TP-31	7.0	SC	131.6	27	756	LL:32, PI:16; G:26.4% S:27.6% F:46.0%
TP-3	7.5	CH	126.3	Su=2,297 psf		LL:73, PI:54; F:86.6%
TP-13	8.0	CL	136.9	Su=1,921 psf		LL:38, PI:22; F:72.7%
TP-26	5.0	CL	128.4	Su=1,378 psf		LL:33, PI:16; F:59.8%
TP-27	4.0	CH	126.7	Su=2,240 psf		LL:81, PI:64; F:75.0%
TP-31	7.5	SC	128.5	Su=1,673 psf		LL:25, PI:9; F:48.9%

All test specimens were obtained from weathered Wasatch Formation

4.10.2 Pavement Support

To assess the suitability of the near-surface earth materials to support traffic loads, three California Bearing Ratio (CBR) tests were performed on representative samples (ASTM D1883). The test results are summarized in Table 4.10.2; detailed test results are presented in Appendix B. The test results suggest that the prevailing near-surface earth materials will provide relatively good pavement support.

Table 4.10.2
Summary of CBR Test Results

Sample Location	Depth (ft.)	CBR		USCS	Index Properties
		0.1”	0.2”		
TP-23	2.5	63.8	84.6	GC	G:40.6% S:33.4% F:26.0%
TP-14	4.5	16.7	20.4	SC	G:2.9% S:57.4% F:39.7%
TP-2	4.0	62.3	78.3	GC	G:41.6% S:40.1% F:18.4%

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5.0 SLOPE STABILITY ASSESSMENT

5.1 GLOBAL STABILITY

The stability of the prevailing slopes have been assessed in accordance with methodologies set forth in Blake et al. (2002) with respect to four representative geologic cross-sections – Sections A-A', B-B', C-C', and D-D', illustrated on Figures D-1 through D-4 in Appendix D (the sections are identified in plan-view on Figure A-5). The stability of the slopes were modeled using SLIDE, a computer application incorporating (among others) Spencer's Method of analysis. Calculations for stability were developed by searching for the minimum factor of safety for a rotational-type failure occurring through the prevailing Wasatch Formation. Analysis was performed for both static and seismic (pseudo-static) cases.

Strength of earth materials were assessed based primarily on the results of laboratory testing, with due consideration of our experience with critical geologic units in other parts of the greater Powder Mountain Resort. For deep-seated geologic units (that generally have little or no impact to slope stability), engineering characteristics were estimated based on our experience in other parts of the greater Powder Mountain project area where these geologic units are near-surface. A summary of selected engineering parameters are presented in Table 5.1a.

Table 5.1a
Engineering Parameters for Geologic Units

Geologic Unit	Moist Unit Weight (Y_m) (pcf)	Effective Friction Angle (ϕ') (deg.)	Cohesion (c') (psf)
Ute Formation (Cu)	125	33	2,000
Wasatch Formation (Tw)	130	31	400
Undivided Mass-Movement/Colluvial (Qmc)	125	31	200
Glacial Deposits (Qgp)	125	34	100
Undivided Alluvium/Colluvium (Qac)	125	31	200
Colluvium (Qc)	125	30	150

Groundwater, e.g., a potentiometric groundwater surface, was not encountered during our subsurface investigation, although localized perched groundwater conditions were

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identified in some areas, one such area being transected by Section C-C'. However, this shallow/perched groundwater is thought to occur largely on the flatter parts of the project area (along the top of the ridge), and therefore is not expected to have a meaningful impact to the global stability. Accordingly, groundwater was not modeled in our limit-equilibrium analysis. Shallow/surficial stability, which would likely be influenced by shallow groundwater, is addressed in Section 5.2.

Pseudo-static (seismic screening) analysis of the existing slopes was performed in general conformance with Blake et al. (2002). The design seismic event was taken as the ground motion with a 2 percent probability of exceedance in 50 years (2PE50). Based on information provided by the ASCE-7-16 *Seismic Hazard Tool*, the geometric mean Peak Ground Acceleration (PGA_M) associated with a 2PE50 event is estimated to be 0.414g. Half of the PGA, (0.207g), was taken as the horizontal seismic coefficient (k_h) (Hynes and Franklin, 1984), and used in the pseudo-static seismic screen analysis.

Our analysis indicates that the static and seismic factors of safety meet or exceed the generally accepted minimum values of 1.5 and 1.0, respectively. Accordingly, the prominent descending slopes that bracket the project area on the southwest and northeast are expected to remain stable from a global stability standpoint during the lifespan of the project. A summary of our slope stability analysis is presented in Table 5.1b; detailed analysis results are presented in Appendix D.

Table 5.1b
Summary of Slope Stability Analysis

Section	Factor of Safety	
	Static	Seismic
A-A'	2.41	1.38
B-B'	2.22	1.27
C-C'	1.94	1.20
D-D'	1.95	1.19

5.3 SURFICIAL STABILITY

Surficial stability pertains to shallow, surficial failures within unconsolidated sediments; such failures would typically occur under saturated, parallel seepage conditions. Shallow groundwater is known to occur within the designated "shallow groundwater areas", delineated with a dashed green outline on Figure A-5. The risk of a future shallow, surficial failure is qualitatively assessed to be low within this area since these areas are relatively flat.

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The steepest natural gradient *within the project area* is approximately 3.6H:1V (about 28 percent gradient). To assess the potential for surficial instability arising from saturated, parallel seepage conditions (which could occur due to snow melt or heavy rain), an infinite slope stability model was utilized (Abramson et al., 1995). For this assessment, the following parameters were assumed:

- Effective friction angle (ϕ'): 30°.
- Cohesion: 150 psf
- Saturated unit weight of soil: 135 pcf
- Slope gradient: 28° (3.6H:1V)
- Depth of saturation: 4 feet

Based on these assumptions, the analysis indicates that the slope will maintain a minimum factor of safety of 1.25. This result suggests that the steepest natural slopes within the project area are largely stable under saturated/parallel seepage conditions, although localized slope failures are possible should such conditions develop. Sample calculations are presented on Figure D-5 in Appendix D.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

Based on the results of the field observations and literature review, **the subsurface conditions are considered suitable for the proposed development from a geotechnical and geologic hazard perspective provided that the recommendations presented in this report are incorporated into the design and construction of the project.**

Supporting data upon which the following conclusions and recommendations are based have been presented in the previous sections of this report. The recommendations presented herein are governed by the physical properties of the earth materials encountered in the subsurface explorations. If subsurface conditions other than those described herein are encountered in conjunction with construction, and/or if design and layout changes are initiated, IGES must be informed so that our recommendations can be reviewed and revised as deemed necessary.

6.2 GEOLOGIC CONCLUSIONS AND RECOMMENDATIONS

Based upon the data collected and reviewed as part of the geologic hazard assessment, IGES makes the following conclusions regarding the geological hazards present at the *Shelter Hill Development* project area:

- **The Shelter Hill project area appears to have a semi-localized shallow groundwater hazard that is capable of adversely impacting different parts of the development. Beyond the shallow groundwater hazard, no other geologic hazards have been identified that are currently considered capable of adversely impacting the proposed development.**

- Thirty-one exploration test pits were excavated at representative locations across the property to evaluate the subsurface materials and to assess the geologic conditions. The test pits were excavated to depths of between 8 and 11 feet below existing grade, with groundwater seepage encountered in 12 of the 31 test pits.

- In general, the subject property is mantled by between 1 and 2 feet of topsoil forming on a thin (less than 2-foot-thick) cobbly colluvium unit or weathered Wasatch Formation bedrock, which extended to the maximum depth of exploration in all the test pits. The colluvium unit was notably absent in the northernmost test pits. The Wasatch Formation in this area consists of loosely consolidated conglomerate bedrock that generally weathers and disaggregates into a moderate reddish brown to dark reddish brown to moderate reddish orange, clayey SAND with

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gravel (SC) grading to clayey GRAVEL with sand (GC), commonly with cobbles and boulders up to several feet in diameter. Thin to thick lenses and beds of sandy lean to fat CLAY (CL-CH) was also observed in some test pits.

- Shallow groundwater, as shallow as 4½ feet below the existing ground surface, was encountered in 12 of the 31 test pits. In a few of these test pits, the groundwater occurrence was a perched seepage that slowly filled the test pit, while in most of these test pits a steady flow of groundwater was encountered at a depth of between 7 and 8 feet below existing grade, which quickly filled the pits. The shallow groundwater hazard risk is considered to be high in the area of these test pits (delineated as *shallow groundwater areas* on Figure A-5), and low to moderate for the rest of the property.

- Slope stability modeling indicates that the existing natural slopes associated with the subject property are stable under static and seismic conditions, and no evidence of landslide deposits was observed on the property in the aerial imagery review, site reconnaissance, or in the subsurface as a part of this investigation. Given this data, the subject property is not anticipated to be adversely impacted by landslide hazards. However, given the presence of shallow groundwater conditions and the proximity to steep slopes and mapped landslide deposits east of the eastern margin of the property, the landslide/mass-movement hazard risk is considered to be low to moderate for those lots along the eastern margin of the property, and low for the rest of the property.

- Earthquake ground shaking may potentially affect all parts of the project area, and is likely to be very strong to severe in the event of an earthquake along the Weber Segment of the Wasatch Fault Zone.

- Rockfall, debris-flow, flooding, surface-fault-rupture, and liquefaction hazard risk is considered to be low for the property.

Given the conclusions listed above, IGES makes the following recommendations:

- Given the presence of shallow groundwater conditions across much of the property, it is recommended that any structures that are to be constructed within the identified shallow groundwater areas on Figure A-5 be on-grade structures without basements, unless groundwater remediation efforts are performed (e.g., installation of land drains). One option to mitigate the groundwater hazard is by way of the installation of basement foundation drains for all subterranean structures in these areas. Foundation drains should daylight (gravity feed) to a

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suitable location such as a storm drain or a natural surface drainage, if permitted. Barring this, the foundation drain should daylight to a chamber located below the lowest finish floor elevation, equipped with a sump pump as a precaution. Land drains to drain the impacted areas are also an option; reduction of groundwater throughout the impacted area will also serve to improve slope stability.

- Slope stability modeling on a lot-by-lot basis should be performed for all lots that are adjacent to the eastern margin of the property (Lots 1-9 and 32-39, based on the most recent site plan) once final grading plans are developed for the lots. Such slope stability modeling may require additional subsurface investigation and laboratory testing to provide site-specific geologic conditions for a particular lot.

- An engineering geologist should observe and document the foundation excavations for proposed structures to assess whether the excavations have been taken to an appropriate depth and into suitable subsurface materials, to assess the subgrade preparation, and to further evaluate for adverse geologic conditions.

6.3 EARTHWORK

6.3.1 General Site Preparation and Grading

Below proposed structures, fills, and man-made improvements, all vegetation, topsoil, debris and undocumented fill (if any) should be removed. Any existing utilities should be re-routed or protected in place. The exposed native soils should then be proof-rolled with heavy rubber-tired equipment such as a scraper or loader. Any soft/loose areas identified during proof-rolling should be removed and replaced with structural fill. All excavation bottoms should be observed by an IGES representative during proof-rolling or otherwise prior to placement of engineered fill to evaluate whether soft, loose, or otherwise deleterious earth materials have been removed, and to assess compliance with the recommendations presented in this report.

6.3.2 Excavations

Soft, loose, or otherwise unsuitable soils beneath structural elements, hardscape or pavements may need to be over-excavated and replaced with structural fill. Where over-excavation is required, the excavations should extend ½ foot laterally for every foot of depth of over-excavation. Excavations should extend laterally at least two feet beyond flatwork, pavements, and slabs-on-grade. Structural fill should consist of granular materials and should be placed and compacted in accordance with the recommendations presented in this report.

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Prior to placing structural fill, all excavation bottoms should be scarified to at least 6 inches, moisture conditioned as necessary at or slightly above optimum moisture content (OMC), and compacted to at least 90 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (Modified Proctor).

6.3.3 Excavation Stability

The contractor is responsible for site safety, including all temporary trenches excavated at the site and the design of any required temporary shoring. The contractor is responsible for providing the "competent person" required by Occupational Safety and Health (OSHA) standards to evaluate soil conditions. For planning purposes, Soil Type C may be assumed at the site (granular soils). Close coordination between the competent person and IGES should be maintained to facilitate construction while providing safe excavations.

Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. Where very moist soil conditions or groundwater is encountered, or when the trench is deeper than 5 feet, we recommend a trench-shield or shoring be used as a protective system to workers in the trench. As an alternative to shoring or shielding, trench walls may be laid back at 1.5H:1V (34 degrees) in accordance with OSHA Type C soils. Trench walls may need to be laid back at a steeper grade pending evaluation of soil conditions by the geotechnical engineer. Soil conditions should be evaluated in the field on a case-by-case basis. Where Wasatch Formation bedrock is exposed, excavations or trench walls may be able to be laid-back at 1H:1V, pending written field-approval by IGES or the OSHA ‘competent person’.

6.3.4 Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill should consist of granular native soils, which may be defined as soils with less than 30% fines, 10-60% sand, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension). Structural fill should also be free of vegetation and debris. All structural fill should be 1-inch minus material when within 1 foot of any base coarse material. Soils not meeting these criteria may be suitable for use as structural fill; however, such soils should be evaluated on a case-by-case basis and should be approved by IGES prior to use.

All structural fill should be placed in maximum 4-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 6-inch loose lifts if compacted by light-duty rollers, and maximum 8-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. Additional lift thickness may be allowed by IGES provided the Contractor can demonstrate

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sufficient compaction can be achieved with a given lift thickness with the equipment in use. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. Structural fill underlying all shallow footings and pavements should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557. **The moisture content should be at, or slightly above, the OMC for all structural fill**. Any imported fill materials should be approved prior to importing. Also, prior to placing any fill, the excavations should be observed by IGES to confirm that unsuitable materials have been removed. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report.

Specifications from governing authorities such as Weber County and/or special service districts having their own precedence for backfill and compaction should be followed where more stringent.

6.3.5 Oversize Material

Based on our observations, there is a significant potential for the presence of oversize materials (larger than 6 inches in greatest dimension). Large rocks, particularly boulders (>12 inches), may require special handling, such as segregation from structural fill, and disposal.

6.3.6 Utility Trench Backfill

Utility trenches should be backfilled with structural fill in accordance with Section 6.3.4 of this report. Utility trenches can be backfilled with the onsite soils free of debris, organic and oversized material. Prior to backfilling the trench, pipes should be bedded in and shaded with a uniform granular material that has a Sand Equivalent (SE) of 30 or greater. Pipe bedding may be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean ¾-inch gravel. Native earth materials can be used as backfill over the pipe bedding zone. All utility trenches backfilled below pavement sections, curb and gutter, and hardscape, should be backfilled with structural fill compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches should be backfilled and compacted to approximately 90 percent of the MDD (ASTM D-1557). However, in all cases the pipe bedding and shading should meet the design criteria of the pipe manufacturer. Specifications from governing authorities having their own precedence for backfill and compaction should be followed where they are more stringent.

6.4 FOUNDATION RECOMMENDATIONS

Based on our field observations and considering the presence of relatively competent native earth materials, we recommend that the footings for proposed single-family homes be founded either *entirely* on competent native bedrock (Wasatch Formation) or *entirely* on structural fill. Bedrock/fill transition zones are not allowed – transition zones

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will likely result in excess differential settlement of the home. Where soft, loose, or otherwise deleterious earth materials are exposed on the foundation subgrade, IGES recommends a minimum over-excavation of 2 feet and replacement with structural fill, such that the entire structure is underlain by a relatively uniform fill blanket. Alternatively, the foundations may be extended such that the foundations bear directly on competent earth materials (Wasatch Formation). We recommend that IGES assess the bottom of the foundation excavation prior to the placement of steel or concrete, or structural fill, to identify the competent native earth materials as well as any unsuitable soils or transition zones. Additional over-excavation may be required based on the actual subsurface conditions observed.

Shallow spread or continuous wall footings constructed *entirely* on competent, uniform bedrock (Wasatch Formation), or *entirely* on a minimum of 2 feet of granular structural fill *overlying bedrock*, may be proportioned utilizing a maximum net allowable bearing pressure of **3,600 pounds per square foot (psf)** for dead load plus live load conditions. The net allowable bearing value presented above is for dead load plus live load conditions. The allowable bearing capacity may be increased by one-third for short-term loading (wind and seismic). The minimum recommended footing width is 20 inches for continuous wall footings and 30 inches for isolated spread footings.

All conventional foundations exposed to the full effects of frost should be established at a minimum depth of 42 inches below the lowest adjacent final grade. Interior footings, not subjected to the full effects of frost (i.e., *a continuously heated structure*), may be established at higher elevations, however, a minimum depth of embedment of 12 inches is recommended for confinement purposes.

Foundation drains should be installed around below-ground foundations (e.g., basement walls) to minimize the potential for flooding from shallow groundwater or seepage, which may be present at various times during the year, particularly spring run-off.

6.5 SETTLEMENT

Static settlements of properly designed and constructed conventional foundations, founded as described in Section 6.4, are anticipated to be on the order of ¾ inch or less. Differential settlement is expected to be half of the total settlement over a distance of 30 feet.

6.6 EARTH PRESSURES AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance against

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concrete, a coefficient of friction of 0.45 for undisturbed earth materials or structural fill should be used.

Ultimate lateral earth pressures from natural soils and *granular* backfill acting against retaining walls and buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 6.6. The coefficients and densities presented in Table 6.6 assume no buildup of hydrostatic pressures. The force of the water should be added to the presented values if hydrostatic pressures are anticipated.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures. Therefore, clayey soils should not be used as retaining wall backfill. Backfill should consist of either native granular soil or sandy imported material with an Expansion Index (EI) less than 25.

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation (i.e., a basement wall), the at-rest condition should be used. However, according to the IBC, foundation walls for buried or partially buried structures are allowed to be designed for active pressures if no more than 8 feet of the wall extends below grade and are laterally supported by flexible diaphragms.

Table 6.6
Recommended Lateral Earth Pressure Coefficients

Condition	Level Backfill		2:1 Backfill	
	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active (Ka)	0.297	37.2	0.525	65.7
At-rest (Ko)	0.500	62.5	0.883	110.5
Passive (Kp)	4.143	518	-	-

The values listed in Table 6.6 should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

6.7 RETAINING WALL DESIGN

The subsurface data provided in this report may be used for retaining wall design. Retaining wall design should be completed under a separate design package that contains

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construction drawings and specifications for each specific wall. The design package should include elevation (profile) drawings, stationing, section drawings and construction specifications for the particular wall type and planned accessories such as fencing. Drawings should be completed so that accurate construction layout can be provided.

6.8 CONCRETE SLAB-ON-GRADE CONSTRUCTION

To minimize settlement and cracking of slabs, and to aid in drainage beneath the concrete floor slabs, all concrete slabs should be founded on a minimum 4-inch layer of compacted gravel overlying properly prepared subgrade. The gravel should consist of free-draining gravel or road base with a ¾-inch maximum particle size and no more than 5 percent passing the No. 200 mesh sieve. The layer should be compacted to at least 95 percent of the MDD as determined by ASTM D-1557.

All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fibermesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of 4''×4'' W2.9×W2.9 welded wire mesh within the middle third of the slab. We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI). A Modulus of Subgrade Reaction of **260 psi/inch** may be used for design.

A moisture barrier (vapor retarder) consisting of 10-mil thick Visqueen (or equivalent) plastic sheeting should be placed below slabs-on-grade where moisture-sensitive floor coverings or equipment is planned. Prior to placing this moisture barrier, any objects that could puncture it, such as protruding gravel or rocks, should be removed from the building pad. Alternatively, the subgrade may be covered with 2 inches of clean sand.

6.9 MOISTURE PROTECTION AND SURFACE DRAINAGE

Surface moisture should not be allowed to infiltrate into the soils in the vicinity of the foundations. As such, design strategies to minimize ponding and infiltration near the structures should be implemented.

We recommend roof runoff devices be installed to direct all runoff a minimum of 10 feet away from foundations. The builder should be responsible for compacting the exterior backfill soils around the foundation; failure to properly compact the basement backfill can result in excessive settlement and damage to exterior improvements such as pavement or other flatwork. Additionally, the ground surface within 10 feet of the structures should be

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constructed so as to slope a minimum of **five** percent away from the structure. Pavement sections should be constructed to divert surface water off the pavement into storm drains, curb/gutter, or another suitable location.

Where basements are planned, IGES recommends a perimeter foundation drain be constructed in accordance with the International Residential Code (IRC).

6.10 PAVEMENT

6.10.1 Pavement Design

Some of the near-surface soils contained a significant clay fraction, generally ranging from about 20% to as much as 50% or more. CBR testing indicates the most clay-rich specimen tested had a CBR of 16.7 (0.1" deflection), although the other two CBR tests indicated fairly high CBR values. Accordingly, based on our observations, for pavement design we have modeled a CBR of 16. Anticipated traffic volumes were not available at the time this report was prepared; however, based on our understanding of the project development we assume traffic on the roadways would consist primarily of passenger cars with occasional heavy vehicles associated with construction, municipal waste collection, public transportation, fire trucks, and similar. The following pavement designs have been developed for a 20-year design life assuming a 0 percent annual growth rate, and our assumed equivalent single axle load (ESAL) of 200,000 ESALs for interior roadways. Based on the information obtained and the assumptions listed above, recommended pavement section alternatives are presented in Table 5.10.

Table 5.10
Pavement Design CBR 16 – SC and GC

Material Type	Option 1	Option 2
Asphalt Concrete Pavement (inches)	3.5	3.5
Untreated Road Base (inches)	6	9
Subbase	6	None

The pavement section thicknesses presented in Table 5.10 assume that there is no mixing over time between the road base and the clayey subgrade. In order to minimize mixing or fines migration, and thereby prolong the life of the pavement section, we recommend that the owner place a 4-oz. non-woven filter fabric between the native soils and the aggregate section, such as the **Mirafi 140N** or an IGES-approved equivalent.

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During construction, a significant amount of heavy construction traffic occurs. Some distress may manifest on pavement sections during this initial construction time period. Maintenance may need to be performed after completion of construction. A somewhat improved pavement section may be desirable if significant construction traffic is anticipated, e.g. if future development south of the Shelter Hill development is planned (e.g. the Owner could add 1 inch of asphalt and four inches of UTBC to help mitigate distress from significant construction traffic – this is a somewhat qualitative assessment, thus the Owner may wish to consult a *transportation engineer* with expertise in pavement design for a more precise assessment). It should also be noted that a minimum of 4 inches of asphalt will generally be more resistant to damage from snowplows.

As a minimum, the upper 4 inches of the native subgrade beneath all pavement sections should be reworked in-place and compacted to at least 93% of the MDD with the moisture content at or slightly above the OMC as determined by ASTM D-1557 (highly organic earth materials that appear to be topsoil should not be left in-place or be allowed to be mixed-in with the reworked soil). Asphalt has been assumed to be a high stability plant mix and untreated base course material (UTBC) composed of crushed stone with a minimum CBR of 70. UTBC should be compacted to a minimum density of 95 percent as determined by ASTM D-1557 (Modified Proctor). Asphalt should be compacted to a minimum of 96 percent of the Marshall maximum density. Asphalt and aggregate base material should conform to local requirements. Subbase should be a coarse, granular pit-run material with a minimum CBR of 30.

Where Portland Cement Concrete (PCC) pavements are planned, such as near trash enclosures or other areas expected to support heavy truck traffic, the pavement is recommended to be a minimum of 5 inches in thickness. Concrete pavement should be underlain by a minimum 6 inches of aggregate base course.

If conditions vary significantly from our stated assumptions, IGES should be contacted so we can modify our pavement design parameters accordingly.

6.10.2 Pavement Construction

The preceding pavement design options meet AASHTO design guidelines; however, where particularly soft, pumping subgrade is encountered, difficulty may be encountered during construction, particularly with respect to stabilization of the pavement subgrade (such conditions may be encountered locally). If soft, pumping soils or mobility problems arise during construction, one of the following options may be implemented:

A. Where soft subgrade is encountered, over-excavate a minimum of 12 inches and then place Mirafi RS380i subgrade reinforcement (or an engineer-approved equivalent) on

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the exposed subgrade, and then place 12 inches of subbase over the reinforcement fabric. *The subbase should be compacted in two lifts*; some pumping/deflection may be noticed during compaction of the first lift, however upon placement of the final lift the 12 inches of subbase over RS380i is expected to stabilize the subgrade. If this option is selected, a separation fabric is not required, as the RS380i also performs that function.

B. Stabilization of soft or pumping subgrade can also be accomplished by using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 3 inches in nominal diameter, but less than 6 inches. Alternately, a locally available pit-run gravel may be suitable but should contain a high percentage of particles larger than 3 inches diameter and have less than 5 percent fines (material passing the No. 200 Sieve). A pit-run gravel may not be as effective as a coarse, angular material in stabilizing the soft soils and will likely require more material be placed. The stabilization material should be worked (pushed) into the soft subgrade soils until a relatively firm and unyielding surface is established. Once a relatively firm and unyielding surface is achieved, the area may be brought to final design grade using structural fill. Other earth materials not meeting aforementioned criteria may also be suitable; however, such material should be evaluated on a case-by-case basis and should be approved by IGES prior to use.

C. Where soft soils are encountered, the Contractor should consider compaction using static methods (e.g., wheel-rolling with heavy earth-moving equipment such as a loader or scraper). Compaction over soft soils using vibratory methods often proves to be marginally effective.

6.10.3 Frost Heave

The pavement designs presented in Table 5.10 do not take into account the deleterious effects of frost heave (positive volumetric strain of frozen soils). Some of the prevailing near-surface soils generally contain a significant clay fraction; such soils often have a high moisture content and can be particularly susceptible to frost heave. Because the soils may be particularly susceptible to frost heave, the Owner may wish to consider placing a relatively frost-free material below the pavement section, e.g. a coarse subbase material with less than 20 percent fines content. Within the Powder Mountain area, the frost depth is generally taken as 42 inches for design; however, the actual frost depth could be less, or more, depending on location and whether snow removal is maintained throughout the winter since snow often acts to insulate the ground from very cold air. In roadways, frost depth can exceed this value, particularly in shady areas that receive little sun, since snow insulation is negligible due to snow removal.

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The thickness of frost-free material added to the pavement section will be dependent upon the degree of risk of frost heave that is acceptable to the Owner – as a minimum, a distance of 24 inches from finish grade to the frost-susceptible soils would be prudent (total pavement section thickness of 24 inches, which would include asphalt, UTBC, and subbase combined). The Owner may wish to consider additional thickness of frost-free material (generally considered subbase) to further reduce the risk of reduced pavement life arising from frost heave.

6.11 CONSTRUCTION CONSIDERATIONS

6.11.1 Oversize Material

Large boulders up to 36 inches in diameter were observed on the surface and in the subsurface across the property; larger boulders may be present in other parts of the subsurface. As such, development of the property may generate a substantial amount of over-size material (rocks larger than 6 inches in greatest dimension). Large rocks, particularly boulders, may require special handling, such as segregation from structural fill, and disposal.

6.11.2 Groundwater

Shallow groundwater (localized perched conditions) was identified at many locations across the site. Depending on location, groundwater could adversely impact the proposed construction; groundwater could cause equipment mobility problems, and could cause localized excavation instability. In some areas, shallow groundwater presence could be a protracted or perennial condition, and would need to be dealt with accordingly via the installation of temporary or permanent land drains. The Contractor should be aware that shoring and/or localized dewatering may be necessary during construction of the foundations, particularly during spring and early summer.

Considering the wide-spread presence of shallow groundwater, the Owner may wish to consider the use of land drains to reduce the groundwater level over a broader area, which would serve to facilitate development and would improve slope stability across the site.

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7.0 CLOSURE

7.1 LIMITATIONS

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment and experience. As such the solutions and resulting recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and designs, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warrantees, guarantees or other representations are made.

The information presented in this report is based on limited field testing and our understanding of the project. The subsurface data used in the preparation of this report were obtained largely from the explorations made for this project and literature reviewed from readily available published sources. It is very likely that variations in the soil, rock, and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs and/or additional explorations are completed. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations presented in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for our Client's exclusive use on the project identified in the foregoing; ***the use of this report by others is not permitted except by written permission of the Client***. Use of the data, recommendations or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

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7.2 ADDITIONAL SERVICES

We recommend that IGES be retained to review the final design plans, grading plans and specifications to assess whether our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate construction performance and other geotechnical aspects of the project as construction initiates and progresses through its completion.

We recommend that IGES assess the bottom of the foundation excavation prior to the placement of steel or concrete, or structural fill, to identify the competent native earth materials as well as any unsuitable soils or transition zones. Additional over-excavation may be required based on the actual subsurface conditions observed.

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AERIAL PHOTOGRAPHS

Data Set	Date	Flight	Photographs	Scale
1947 AAJ	August 10, 1946	AAJ_1B	88, 89, 90	1:20,000
1953 AAI	September 14, 1952	AAI_4K	34, 35, 36	1:20,000
1963 ELK	June 25, 1963	ELK_3	57, 58, 59	1:15,840

*https://geodata.geology.utah.gov/imagery/

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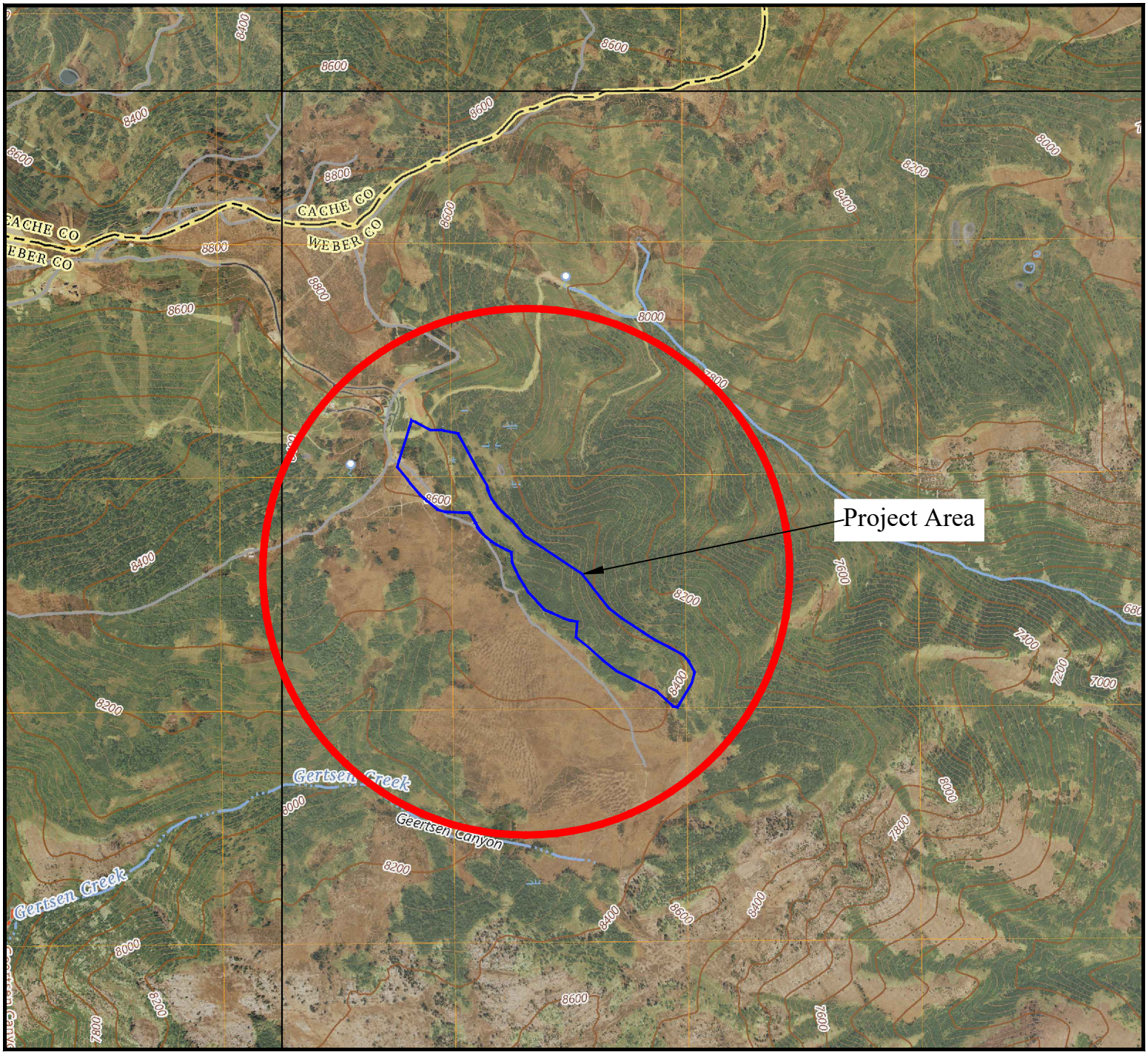
APPENDIX A



Base Map:

-USGS *James Peak, Sharp Mountain, Huntsville,* and *Brown's Hole* 7.5-Minute Topographic Quadrangles (2023).

0 2000 4000

FEET

1" = 2000'

N

UTAH

QUADRANGLE LOCATION

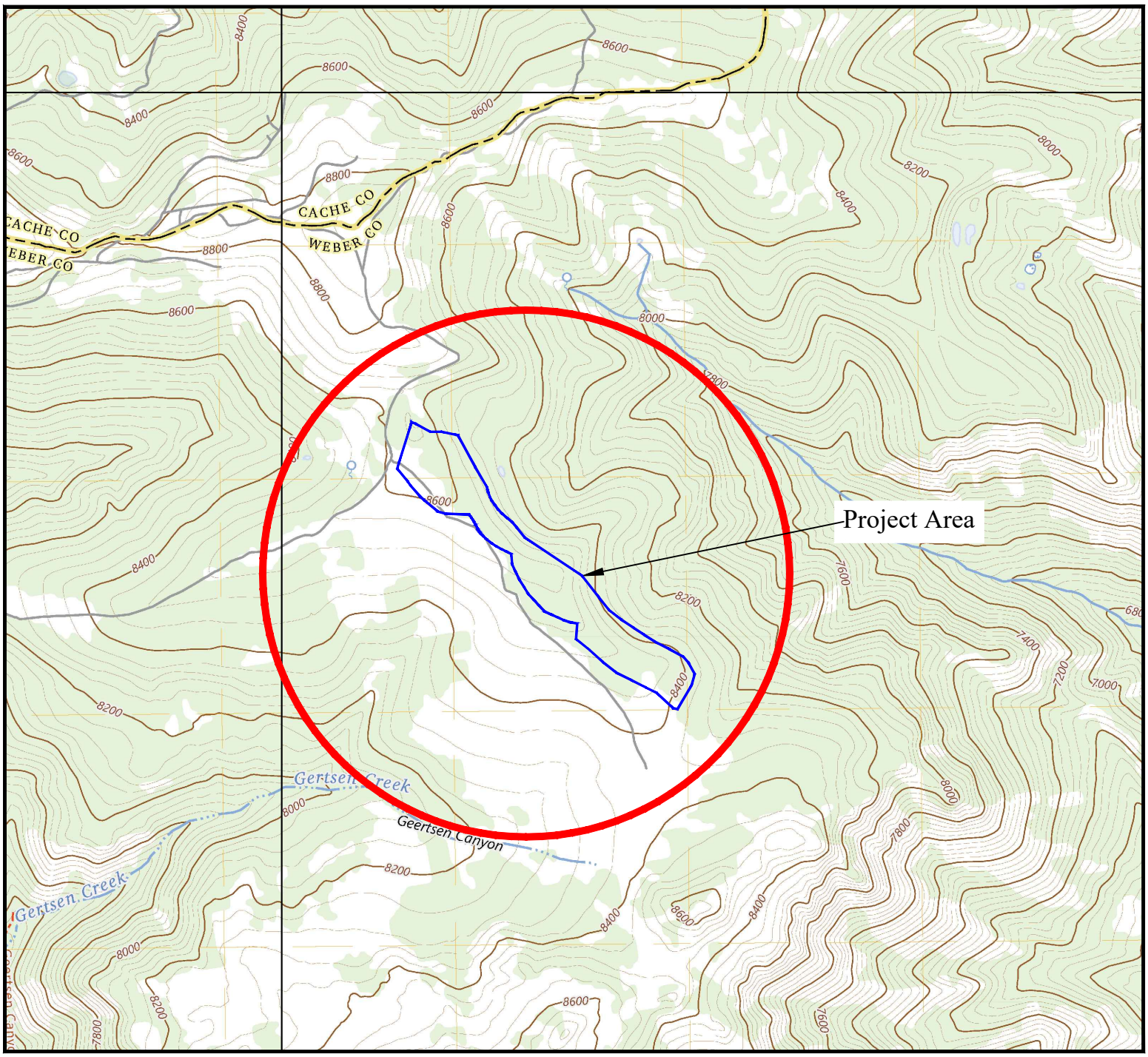
IGES

Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Site Vicinity Map

Figure A-1a



Base Map:

-USGS *James Peak, Sharp Mountain, Huntsville,* and *Brown's Hole* 7.5-Minute Topographic Quadrangles (2023).

0 2000 4000

FEET

1" = 2000'

N

UTAH

QUADRANGLE LOCATION

IGES

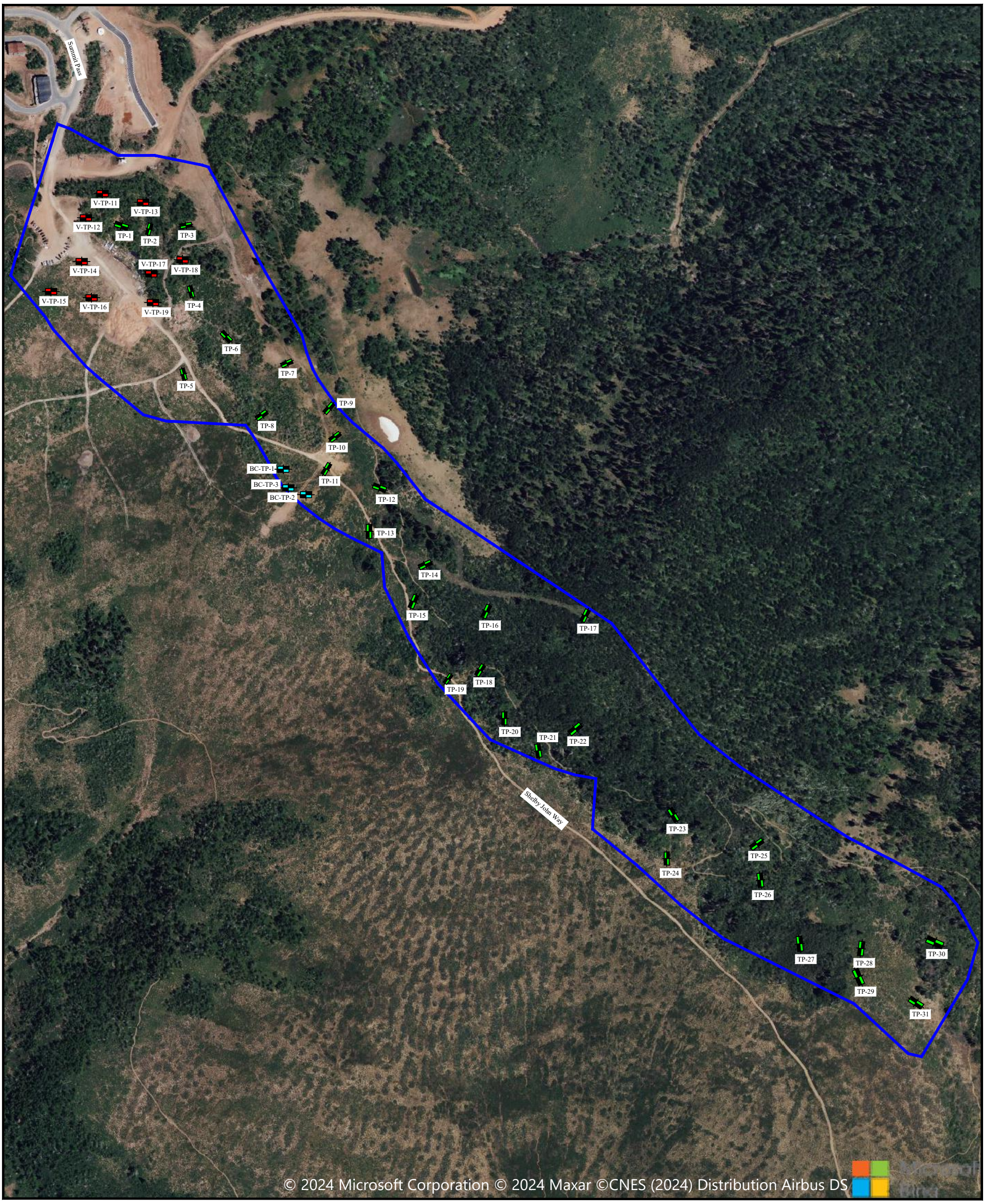
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Site Vicinity Map

Figure

A-1b



Imagery:
- Bing Maps Image, accessed on 06/28/2024.

Legend

TP-31 — Test Pit (IGES, this study)

V-TP-19 — Test Pit (IGES, 2023)

BC-TP-3 — Test Pit (IGES, 2017)

Project Boundary

0 400 800
FEET
1" = 400'

N

IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Aerial Image

Figure

A-2

Topo Data:

-State of Utah and Partners, 2019, Regional Utah high-resolution lidar data 2015 - 2017: Collected by Quantum Spatial, Inc., Digital Mapping, Inc., and Aero-Graphics, Inc. and distributed by OpenTopography, https://doi.org/10.5069/G9RV0KSQ.. Accessed: 2024-06-19

Legend

TP-31 — Test Pit (This Study)

VTP-19 — Test Pit (IGES, 2023)

BC-TP-3 — Test Pit (IGES, 2017)

Project Boundary

D — Cross Section — D'

Slope Grade

- 0% to 25%
- 25% to 30%
- > 30%

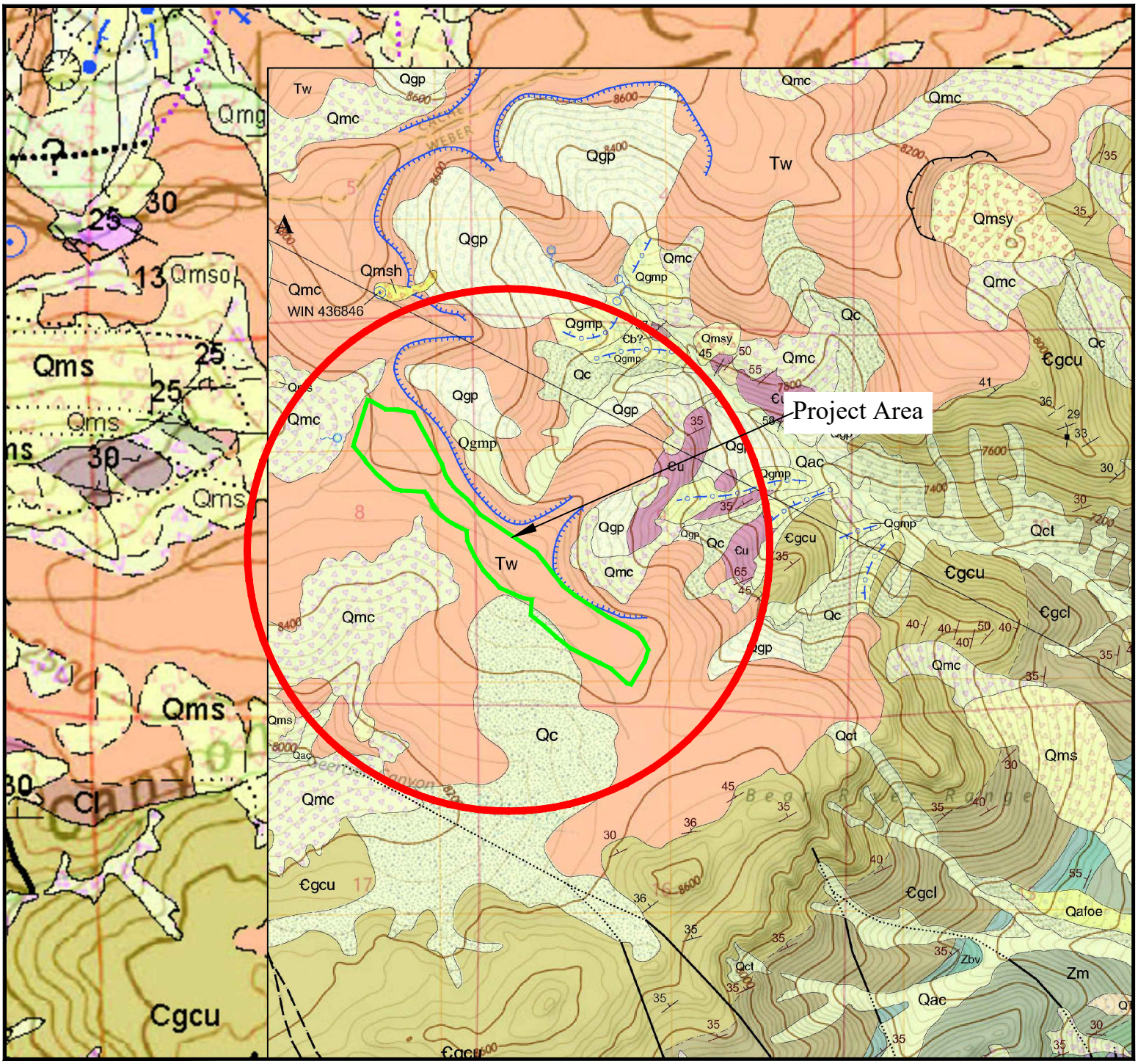
N

0 200 400

FEET

1" = 200'

IGES Project No: 01628-040	Geotechnical and Geologic Hazard Study Shelter Hill Development Powder Mountain Resort Weber County, Utah **Slope Map**	**Figure A-3**



Base Map:

-UGS Interim Geolgic Map of the *Brown's Hole* 7.5-Minute Geologic Quadrangle, Map 760, Anderson, et al (2023)

-UGS *Ogden* 30' X 60' Quadrangle, Map 653 DM, Coogan and King (2016)

*Map Legend on Figure(s) (A-4b and A-4c).

0 2000 4000
FEET
1" = 2000'

N

UTAH
QUADRANGLE LOCATION

IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Regional Geology Map

Figure A-4a

Map Legend

Qc Colluvial deposits (Holocene to Late Pleistocene?) – Poorly sorted silt, sand, gravel, clay, cobbles, and boulders; angular to subangular clasts; rounded clasts derived from Tertiary Wasatch Formation (Tw) are common; massive to poorly bedded; composition depends on local bedrock source; mapped on moderate to steep slopes; includes slope-wash and soil creep deposits and may include local mass-movement and talus deposits; includes residual deposits developed on Wasatch Formation; 6 to 50 feet (2–15 m) thick.

Qac Undivided alluvial and colluvial deposits (Holocene to Late Pleistocene?) – Unsorted to variably sorted silt, sand, gravel, clay, cobbles, and boulders in variable proportions and roundness; includes stream and fan alluvium, colluvium, sheetwash deposits, and locally mass-movement deposits that are too small to map separately at map scale; typically mapped along drainages bounded by hillslopes where colluvium grades into alluvium without distinct break in slope and in smaller drainages lacking flat bottoms or too small to subdivide at map scale; 0 to 20 feet (0–6 m) thick.

Qmc Landslide and colluvial deposits, undivided (Holocene and Pleistocene) – Poorly sorted to unsorted clay- to boulder-sized material; mapped where landslide deposits are difficult to distinguish from colluvium (slopewash and soil creep) and where mapping separate, small, intermingled areas of landslide and colluvial deposits is not possible at map scale; locally includes talus and debris flow and flood deposits; typically mapped where landslides are thin ("shallow"); also mapped where the blocky or rumpled morphology that is characteristic of landslides has been diminished ("smoothed") by slopewash and soil creep; composition depends on local sources; 6 to 40 feet (2-12 m) thick. These deposits are as unstable as other landslide units (Qms, Qmsy, Qmso).

Qms Landslide deposits (Holocene to Late Pleistocene?) – Poorly sorted clay- to boulder-sized material in slides, slumps, flows, and landslide complexes; generally characterized by hummocky topography, head, lateral, and/or internal scarps, and chaotic bedding in displaced blocks; composition reflects local sources; morphology can become more subdued with increasing age and/or rate of movement; mapped where relative age cannot be distinguished or where landslide complexes have parts with different ages and/or rates of activity; thickness highly variable, up to 60 feet (20 m).

Landslides of all ages may continue to exhibit slow creep or are capable of renewed movement if stability thresholds are exceeded (Ashland, 2003). Vegetation and widespread colluvium may conceal unmapped landslides, and more detailed imaging techniques such as lidar may reveal evidence of creep or shallow landslides. Understanding the location, age, and stability of landslides and slopes requires detailed geotechnical investigations.

Qgp Glacial deposits, undivided, Pinedale age (Late Pleistocene) – Non-stratified, poorly sorted clay- to boulder-size sediment; glacial till and a component of outwash; primarily derived from rounded cobbles and boulders of Wasatch Formation (Tw); rare angular clasts derived from local Cambrian units; mapped as undivided glacial deposits because deposits lack distinct geomorphic shapes of end, recessional, and lateral moraines; likely deposited during Pinedale glaciation, which roughly correlates to the colder and wetter Marine Isotope Stage (MIS) 2 (14 to 29 ka; Lisiecki and Raymo, 2005); maximum ice extent in the Wasatch Range occurred between 17.5 and 22 ka (Laabs and Munroe, 2016; Quirk and others, 2018, 2020); estimated thickness up to 50 feet (15 m).

Qgmp Glacial moraine till, Pinedale age (Late Pleistocene) – Till of ground, end, recessional, and lateral moraines; till is non-stratified, poorly sorted clay- to boulder-size sediment, primarily derived from rounded cobbles and boulders of Wasatch Formation; includes rare angular clasts locally derived from Cambrian units; mapped moraines have poorly to moderately developed soil and moderate moraine morphology; unit lacks sharp moraine morphology of other Pinedale age moraines in the Wasatch Range due to nature of source material (rounded clasts from Wasatch Formation); likely deposited during Pinedale glaciation, which roughly correlates to the colder and wetter MIS2 (14 to 29 ka; Lisiecki and Raymo, 2005); maximum ice extent in the Wasatch Range occurred between about 17.5 and 22 ka (Laabs and Munroe, 2016; Quirk and others, 2018, 2020); estimated thickness up to 120 feet (35 m).

Map Legend

Tw Wasatch Formation (Eocene to Paleocene) – Moderate reddish-orange to pale yellowish-orange, cobble to boulder conglomerate with varying amounts of mudstone and sandstone; forms cobble- and boulder-strewn slopes but does not crop out; unconsolidated to consolidated claystone, sandstone, limestone, and dolomite reported in lithologic logs from water wells drilled < 1 mile (0.6 km) west of the western quadrangle border near Powder Mountain ski resort (see logs for Well Identification Number [WIN] 436850 and 436926, Utah Division of Water Rights well database [UDWR], 2022); clasts are tan, gray, purple, and green quartzite and well-indurated sandstone, sourced dominantly from the Brigham Group; lower contact is sharp, unconformable; deposited over considerable paleotopography; que-ried where unit designation uncertain and may be older colluvium or alluvium; may include Cretaceous-age (Maas-trichtian) deposits of the Hams Fork Member of the Evanston Formation in the southeast part of the map, as mapped by Coogan and King (2016); 0 to over 2000 feet (0–610+ m) thick.

Cu Ute Formation (Middle Cambrian) – Light-gray to grayish-blue, thin- to medium-bedded limestone with interbed-ded shaley limestone and dark greenish brown to reddish-orange fissile shale; limestone beds commonly contain twiggy bodies (as described in Lochman-Balk [1976] and Yonkee and Lowe [2004]), bioturbation and fossil hash; resistant packages of medium-bedded limestone commonly oncolitic; marker interval about 600 feet (185 m) above base contains abundant trilobites from biozone Ehmaniella in beds of minor oolitic limestone, intraclast "flat-pebble conglomerate," and thinly bedded gray limestone; Rigo (1968) reported Glossopleura sp. from the basal Ute Forma-tion in neighboring Huntsville quadrangle; shaley limestone is common with ribbons of tan to yellow shale; forms steep slopes with cliffs and ridges of limestone; top of unit contains karsts beneath the Wasatch Formation (Tw); lower contact conformable and mapped at first shale above Langston Formation; mapped by Crittenden (1972) as Ute and Blacksmith Limestones, undivided; we included resistant limestone beds that Coogan and King (2016) mapped as queried Blacksmith Formation because they are not dolomite, but rather oncolitic limestone within an overall shaley limestone sequence; thickness is about 2100 feet (640 m) near South Fork of Ogden River, and about 1700 feet (520 m) on the northwest side of Middle Fork of Ogden River.

Cgcu Upper member of Geertsen Canyon Quartzite of Brigham Group (Early to Middle Cambrian) – Dominantly grayish-yellow to grayish-orange, fine- to medium-grained, well-sorted, well-rounded, quartz arenite; medium- to thick-bedded with trough and planar tabular cross-beds with scoured bases; top part contains intervals of siltstone up to 3 feet (1 m) thick; lower part contains increasing abundance of coarse to very coarse sandstone and matrix- to clast-supported pebble to small cobble conglomerate with well-rounded clasts of red sandstone, tan quartzite, reddish chert, and white quartz; generally very resistant, forms broken cliffs and steep slopes; lower contact is conformable

Headwall of Glacial Cirque

Base Map:

-UGS Interim Geolgic Map of the *Brown's Hole* 7.5-Minute Geologic Quadrangle, Map 760, Anderson, et. al. (2023)

-UGS *Ogden* 30' X 60' Quadrangle, Map 653 DM, Coogan and King (2016).

*All Geologic Contacts Approximately Located; Modified From: Anderson, et. al. (2023).

Topo Data:

State of Utah and Partners, 2019, Regional Utah high-resolution lidar data 2015 - 2017: Collected by Quantum Spatial, Inc., Digital Mapping, Inc., and Aero-Graphics, Inc. and distributed by OpenTopography, https://doi.org/10.5069/G9RV0KSQ. Accessed: 2024-06-19

Contour Interval: 5 ft

Legend

- Qc — Colluvial Deposits (Holocene to Late Pleistocene)
- Qmc — Undivided Mass-Movement and Colluvial Deposits (Holocene to Middle Pleistocene)
- Qgp — Glacial Deposits, Undivided (Late Pleistocene)
- Qgmp — Glacial Moraine Deposits (Late Pleistocene)
- Qac — Alluvium and Colluvium, Undivided (Holocene to Late Pleistocene)
- Tw — Wasatch Formation (Eocene to Paleocene)
- Cu — Ute Formation (Middle Cambrian)
- Planned Development Lots
- TP-31 — Test Pit (This Study)
- V-TP-19 — Test Pit (IGES, 2023)
- BC-TP-3 — Test Pit (IGES, 2017)
- D / D' — Cross Section
- Project Boundary
- Shallow Groundwater Areas

N

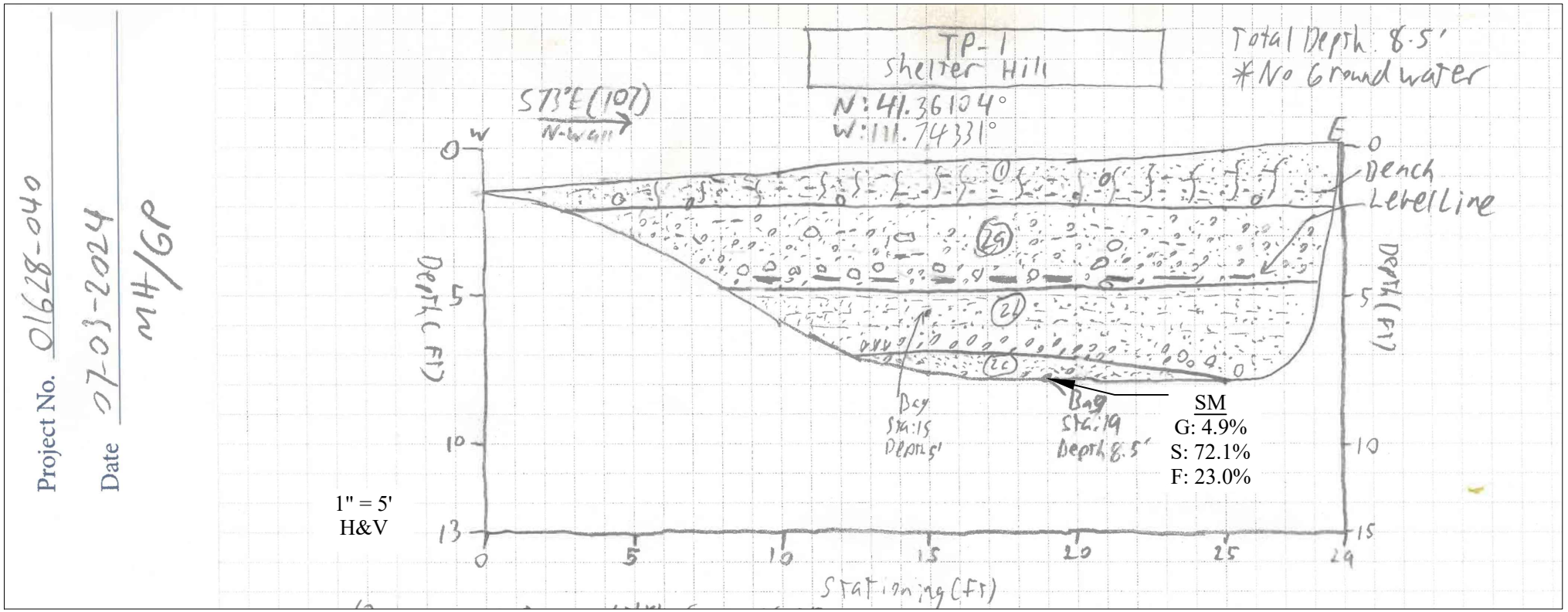
0 200 400
FEET
1" = 200'

IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Geotechnical and Local Geology Map

Figure A-5



Lithologic Unit Descriptions

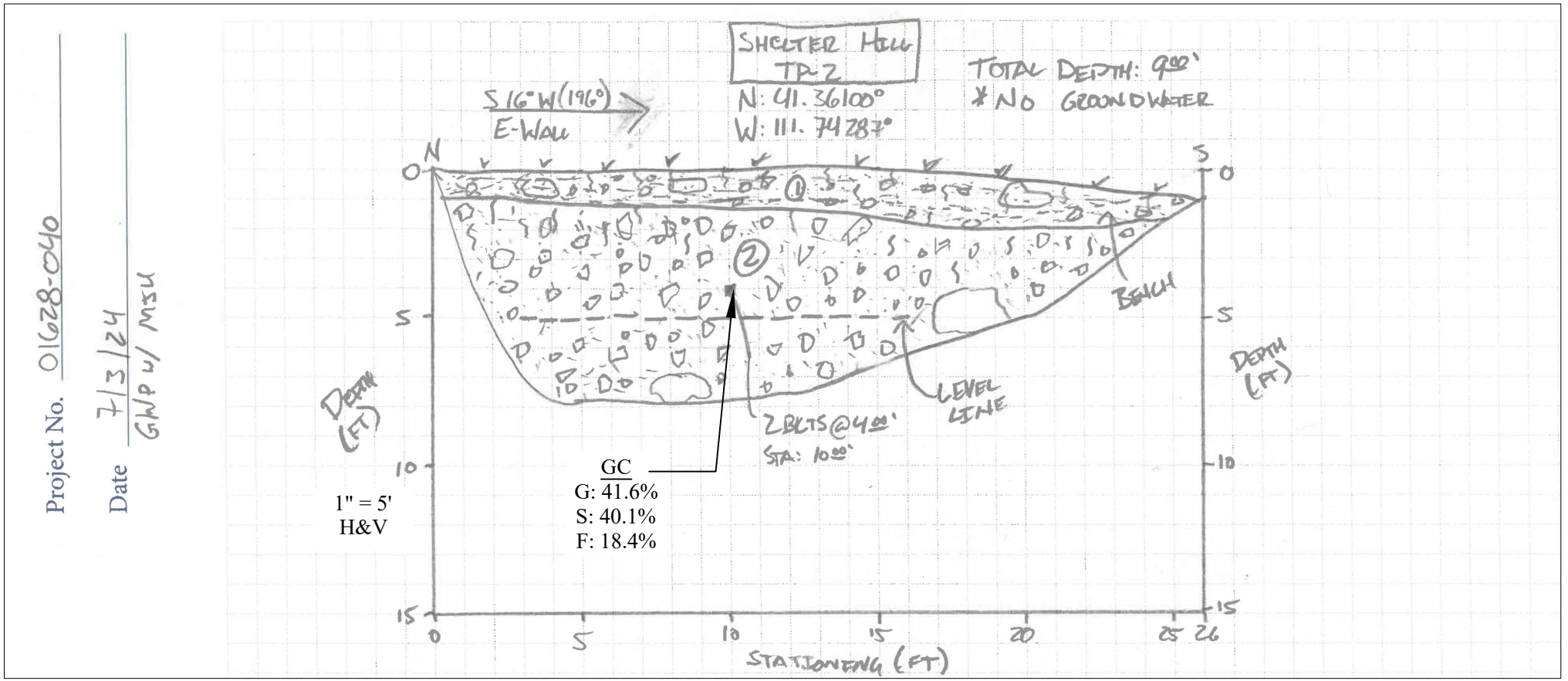
1) **A/B Topsoil:** 1-2' thick; grayish brown (5Y 3/2) to brownish black (5YR 2/1) clayey SAND with gravel (SC), loose, dry to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2' in diameter, mode ~1-2"; sand component is fine-grained to medium-grained; abundant plant and tree roots; irregular, planar basal contact.

2) **Wasatch Formation (Tw):** > 6' thick; highly weathered conglomerate bedrock; 3 soil subunits:

2a. 3' thick; moderate reddish brown (10R 4/6) to moderate reddish orange (10R 6/6) clayey SAND with gravel (SC), medium dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~20-35% of unit; clasts are subangular to subrounded light gray (N7) quartzite and dark gray (N3) dolomite up to 8" in diameter, mode ~1-3"; sand component is medium-grained to coarse-grained; gravel component increases near base of unit; common lenses of sandy lean to fat clay; common roots and root webbing; sharp, planar basal contact.

2b. Up to 3.5' thick; moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) clayey SAND with gravel (SC) grading to sandy lean CLAY with gravel (CL), medium dense to dense, moist, moderate plasticity fines, massive; gravel and larger sized clasts comprise ~10-15% of unit; clasts are subangular to subrounded light gray (N7) quartzite to dark gray (N3) dolomite up to 4" in diameter, mode ~1-2"; clasts are along bottom of unit in a stone line; sand is medium-grained to coarse-grained; trace plant and tree roots; sharp, curvilinear basal contact.

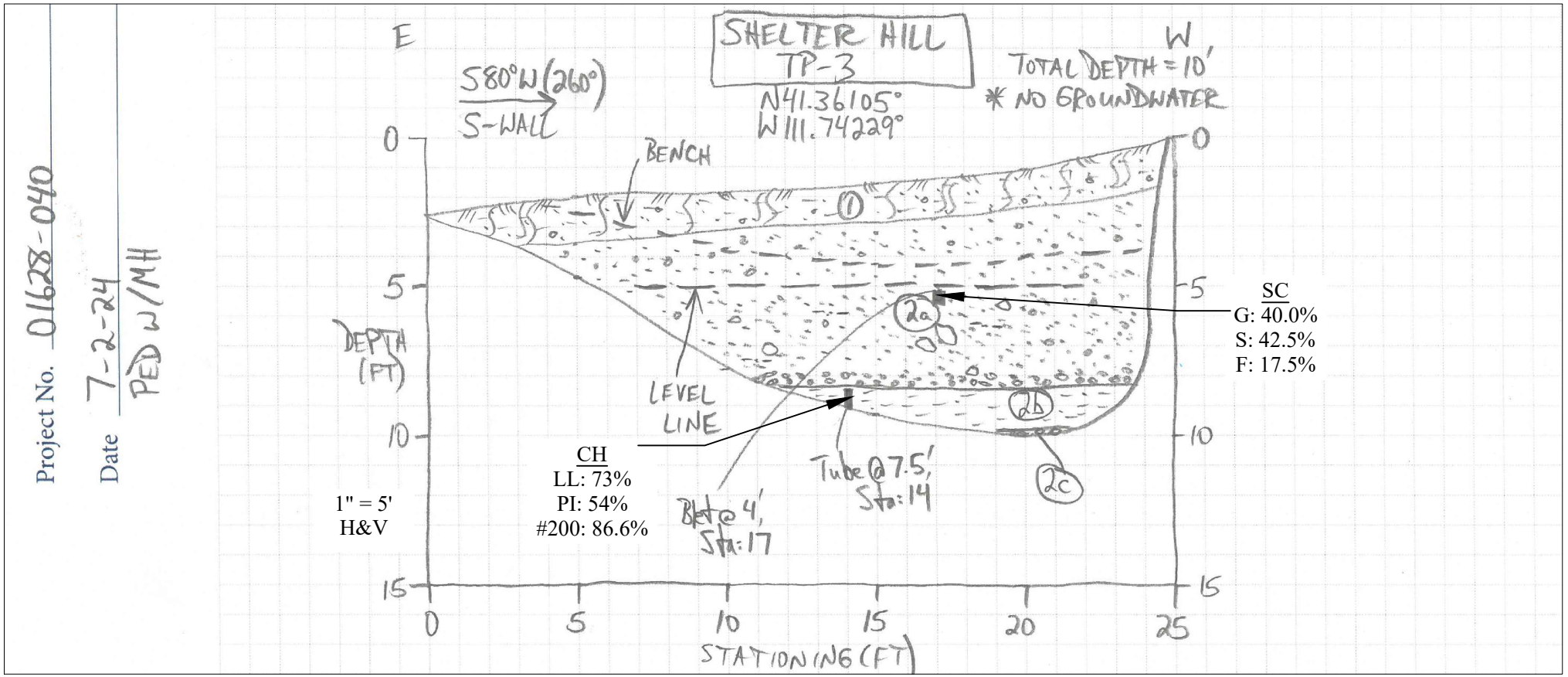
2c. >1'thick; moderate reddish brown (10R 4/6) to dark reddish brown (10R 3/4) poorly-graded SAND with trace gravel (SP), medium dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise up to 5% of unit; clasts are subrounded to subangular light gray (N7) quartzite and dark gray (N3) dolomite <1" in diameter, mode <1/2"; sand is coarse-grained; few fines.



Lithologic Unit Descriptions

1) **A/B Topsoil:** ~1.5-2' thick; grayish brown (5Y 3/2) to brownish black (5YR 2/1) clayey SAND with gravel (SC), loose, dry to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2' in diameter, mode ~1-2"; sand component is fine-grained to medium-grained; abundant plant and tree roots; irregular, planar basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock, largely disaggregated to moderate reddish brown (10R 4/6) with occasional light red (5R 6/6) mottling poorly-graded GRAVEL with sand (GP), loose to medium dense, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~60-70% of unit; clasts are subangular to subrounded medium gray (N5) quartzite, moderate brown (5YR 3/4) sandstone, and light gray (N7) to black (N1) dolomite up to 3' in diameter, mode ~1-2"; sand component is medium-grained to coarse-grained; occasional plant and tree roots in upper part of unit; lithified sandstone in parts.



Lithologic Unit Descriptions

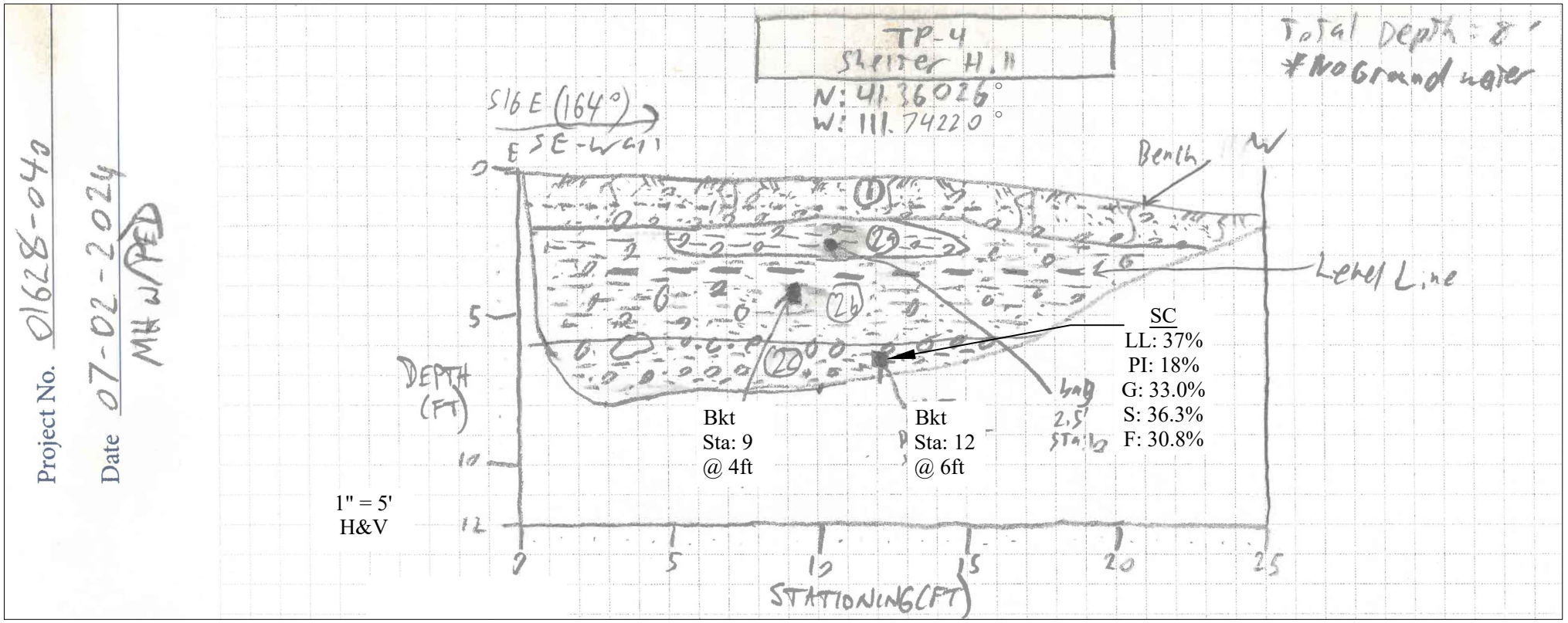
1) **A/B Topsoil:** 1.5' thick; light brown (5YR 6/4) clayey SAND (SC), medium dense, dry, low plasticity fines, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 2" in diameter, mode ~1"; common to abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** > 8.5' thick; highly weathered conglomerate bedrock; 3 soil subunits:

2a. ~6' thick; moderate reddish brown (10R 4/6) to moderate yellowish brown (10YR 5/4) poorly-graded SAND with gravel (SP), medium dense, moist, low plasticity fines, massive to medium bedded; gravel and larger sized clasts comprise ~15-20% of unit, except basal 6" of unit is gravel bed with ~50-70% clasts; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 1' in diameter, mode ~1-3", though mode clast size increases with depth; sand is medium-grained to coarse-grained; few fines, though occasional small silt lenses; basal gravel is ~1/2-1" in diameter; occasional plant and tree roots; sharp, planar basal contact.

2b. 1.5-1.75' thick; dusky red (5R ¾) to dark reddish brown (10R 3/4) sandy fat CLAY (CH), very stiff, moist, moderate plasticity, massive; devoid of clasts, though common white quartzite sand grains; no natural slickensides observed, though mechanically induced slickensides are common; very homogeneous unit; sharp, planar basal contact.

2c. >3' thick; dark reddish brown (10R 3/4) clayey SAND with gravel (SC), dense, moist, low to moderate plasticity fines, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 6" in diameter, mode ~1-2"; sand is fine-grained to medium-grained.



Lithologic Unit Descriptions

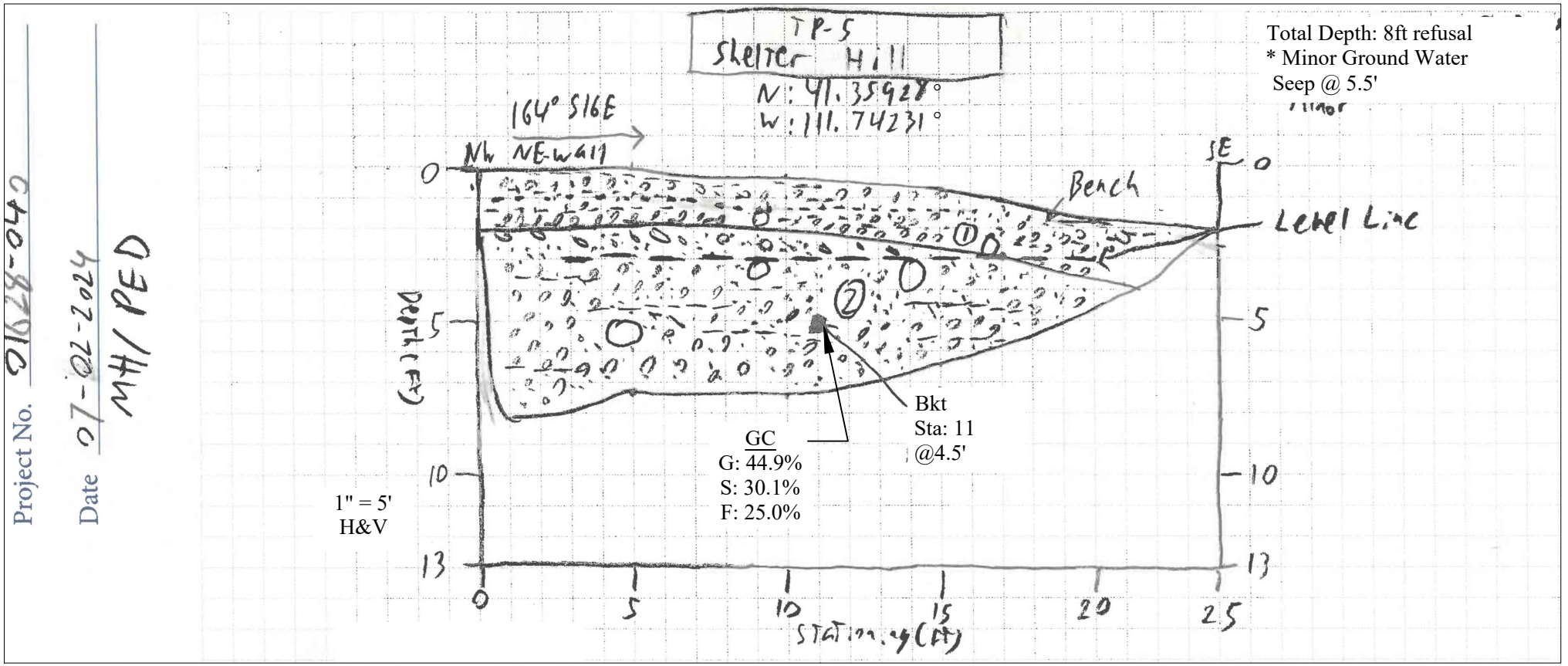
1) **A/B Topsoil/Colluvium (Qc):** Up to 2' thick; grayish brown (5Y 3/2) clayey SAND with gravel (SC), medium dense, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~15-25% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 9" in diameter, mode ~2-3"; sand component is fine-grained to medium-grained; abundant plant and tree roots; sharp, basal planar contact.

2) **Wasatch Formation (Tw):** > 6' thick; highly weathered conglomerate bedrock; 3 soil subunits:

2a. Up to 1' thick; light brownish gray (5YR 6/1) sandy lean to fat CLAY with gravel (CL-CH), medium stiff, moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 3" diameter, mode ~1-2"; subunit pinches out within trench; common roots, organic mats, and webbing; sharp, planar basal contact.

2b. Up to 4' thick; mottled moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) clayey SAND with gravel (SC), dense, slightly moist to moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~10-15% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 4" in diameter, mode ~1-3"; common light gray (N7) sand-filled root traces; sand component is medium-grained to coarse-grained, unit is partially lithified.

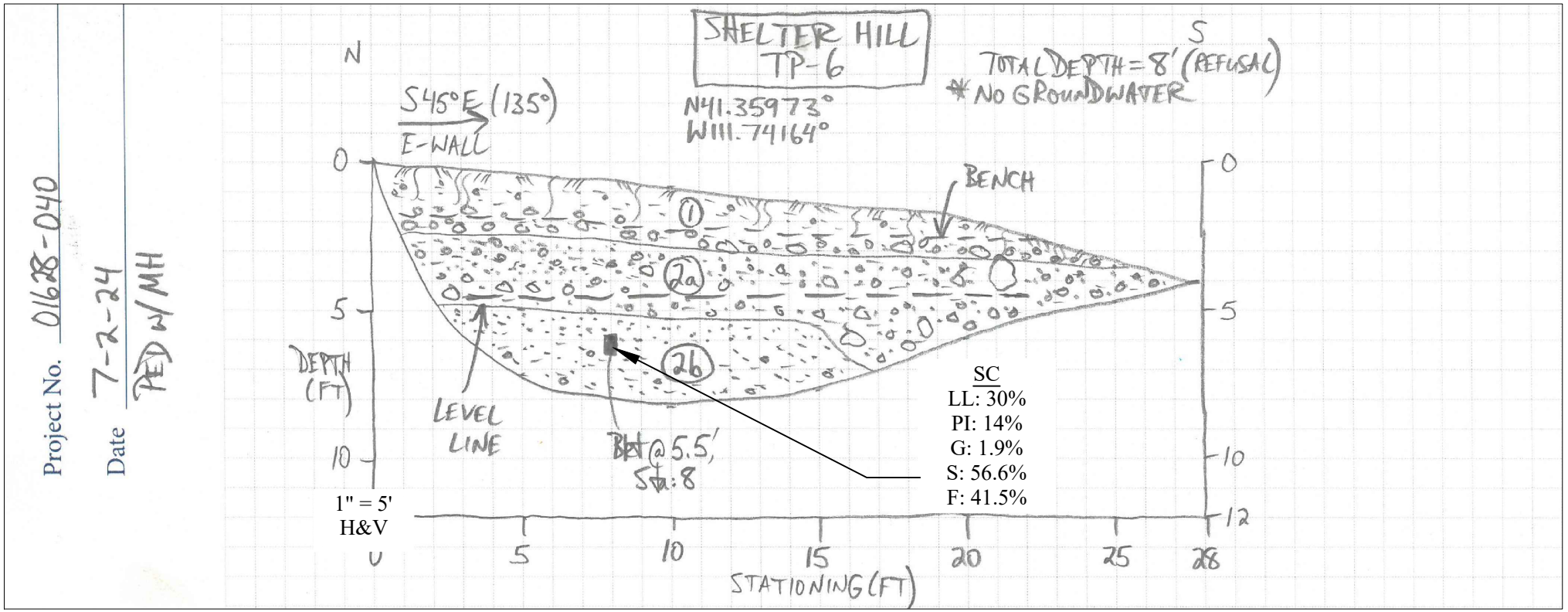
2c. >2' thick; dark reddish brown (10R 3/4) clayey GRAVEL with sand (GC) grading to sandy lean CLAY with gravel (CL), dense to very dense, moist, moderate plasticity fines, massive; gravel and larger sized clasts comprise ~20-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1' in diameter, mode ~1-3"; sand component is fine-grained; top of subunit marked by stone line; few light gray (N7) root traces; unit is partially lithified.



Lithologic Unit Descriptions

1) **A/B Topsoil:** Up to 2' thick; grayish brown (5Y 3/2) clayey SAND with gravel (SC), medium dense, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~25-35% of unit; clasts are subangular to subrounded medium gray (N5) quartzite and dark gray (N3) dolomite up to 2' in diameter, mode ~2-5"; sand component is fine-grained to medium-grained; abundant plant and tree roots; sharp, basal planar contact.

2) **Wasatch Formation (Tw):** >6' thick; variegated moderate reddish brown (10R 4/6) to light gray (N7) to dark yellowish orange (10YR 6/6) to dark reddish brown (10R 3/4) clayey SAND with gravel (SC) grading to clayey GRAVEL with sand (GC), dense to very dense, moist to very moist, low to moderate plasticity fines, weakly bedded to massive; gravel and larger sized clasts comprise ~35-55% of unit; clasts are subangular to subrounded medium gray (N5) quartzite and dark gray (N3) up to 1.25' in diameter; mode ~1-3"; sand component is fine-grained to coarse-grained; common thin lenses of sandy lean to fat clay and sand; common black (N1) manganese oxide staining in places, especially near bottom of test pit; light gray (N7) mottling associated with clay mixed throughout unit where not in lenses.



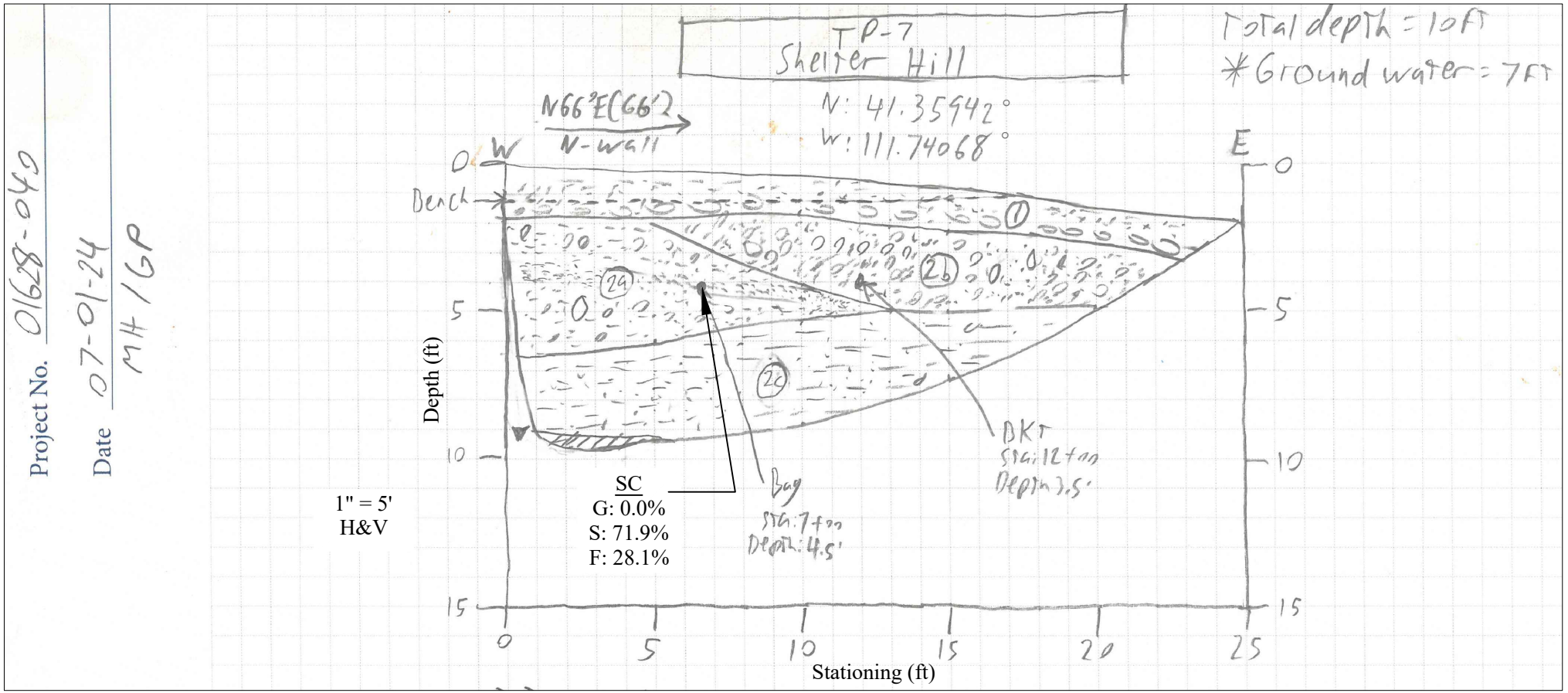
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** ~2.5' thick; grayish brown (5Y 3/2) sandy lean CLAY with gravel (CL) grading to clayey GRAVEL with sand (GC) in basal ~1 foot of unit; medium stiff, dry, low plasticity, massive; gravel and larger sized clasts comprise ~15-50% of unit; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 8" in diameter, mode ~3-5"; basal ~1 foot of unit is coarse colluvial stone line; abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >5.5' thick; highly weathered conglomerate bedrock; two subunits:

2a. ~2.5-4' thick; moderate reddish brown (10R 4/6) clayey GRAVEL with sand (GC) grading to clayey SAND with gravel (SC), medium dense to dense, slightly moist to moist, low plasticity fines, massive to possibly weakly bedded; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 16" in diameter, mode ~2-4"; largely matrix-supported, but clast-supported in places; sand is fine-grained to medium-grained; occasional plant and tree roots; sharp, largely planar basal contact.

2b. >3' thick; dark reddish brown (10R 3/4) to moderate reddish brown (10R 4/6) clayey SAND (SC), very dense, moist, low plasticity fines, massive to thickly bedded; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subrounded to subangular medium gray (N5) to medium light gray (N6) quartzite up to 6" in diameter, mode ~1/2-1"; uppermost ~1 foot is a lighter-colored medium-grained to coarse-grained sand bed; unit becomes denser and partially lithified as a sandstone with depth; basal clayey portion has fine-grained to very fine-grained sand.



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** ~1-2' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 8" diameter, mode ~1-2"; abundant plant and tree roots; stone line in basal ~1' of unit with ~50% gravel; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >8.5' thick; highly weathered conglomerate bedrock; 3 subunits:

2a. Up to 4.5' thick; moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) clayey SAND with gravel (SC) grading to poorly-graded sand (SP), medium dense, moist to wet, low plasticity fines, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subangular to subrounded yellowish gray (5Y 7/2) sandstone and medium gray (N5) quartzite up to 6" in diameter, mode ~2-3"; poorly-graded sand bed is up to 8" thick in middle of subunit; sand is medium-grained to coarse-grained; trace plant and tree roots; groundwater seeping from this subunit on the back wall of the test pit; sharp, planar basal contact.

2b. Up to 3.5' thick; moderate reddish orange (10R 6/6) poorly-graded SAND with gravel and clay (SP) grading to clayey GRAVEL with sand (GC), loose to medium dense, slightly moist to moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~40 to 50% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1.5' in diameter, mode ~2-6"; sand is medium-grained to coarse-grained; trace plant and tree roots; sharp, curvilinear basal contact.

2c. >3.5' thick; moderate reddish orange (10R 6/6) sandy fat CLAY (CH), medium stiff to stiff, slightly moist, moderate to high plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1/2" diameter, mode <1/8"; sand is medium-grained to coarse-grained; common organics.

IGES

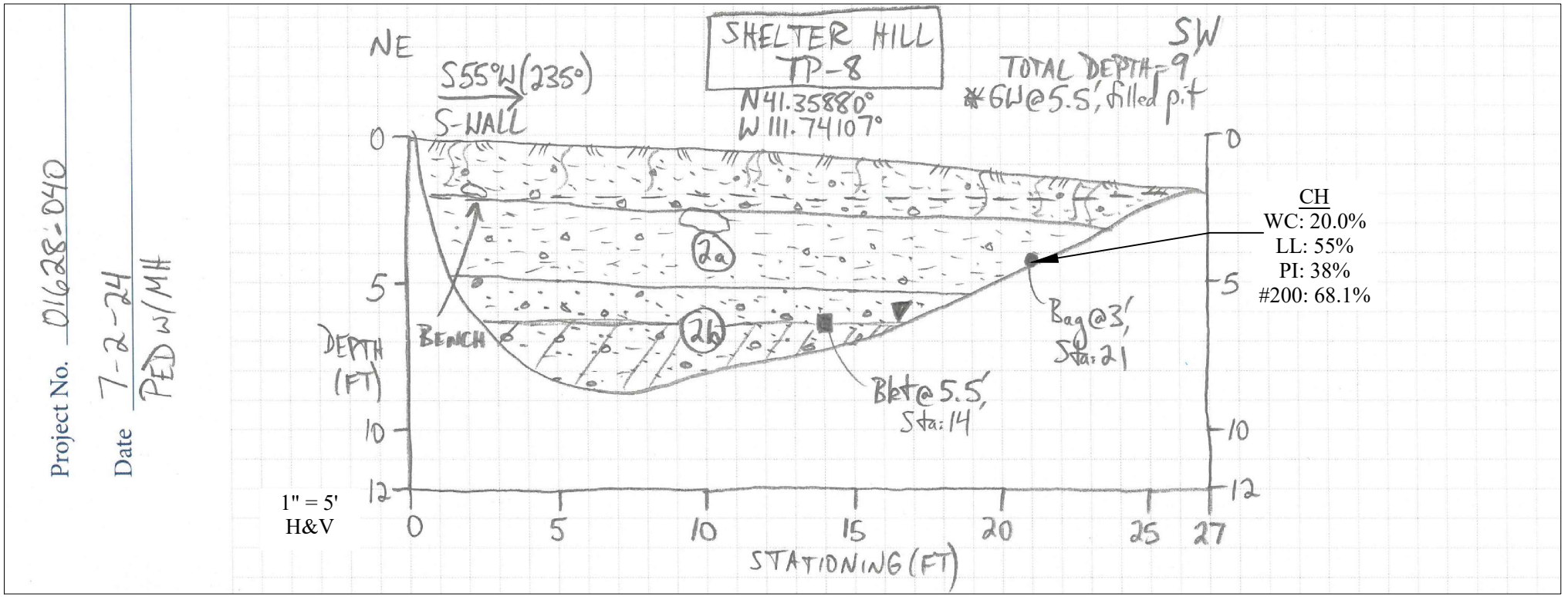
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

TP-7 Log

Figure

A-12



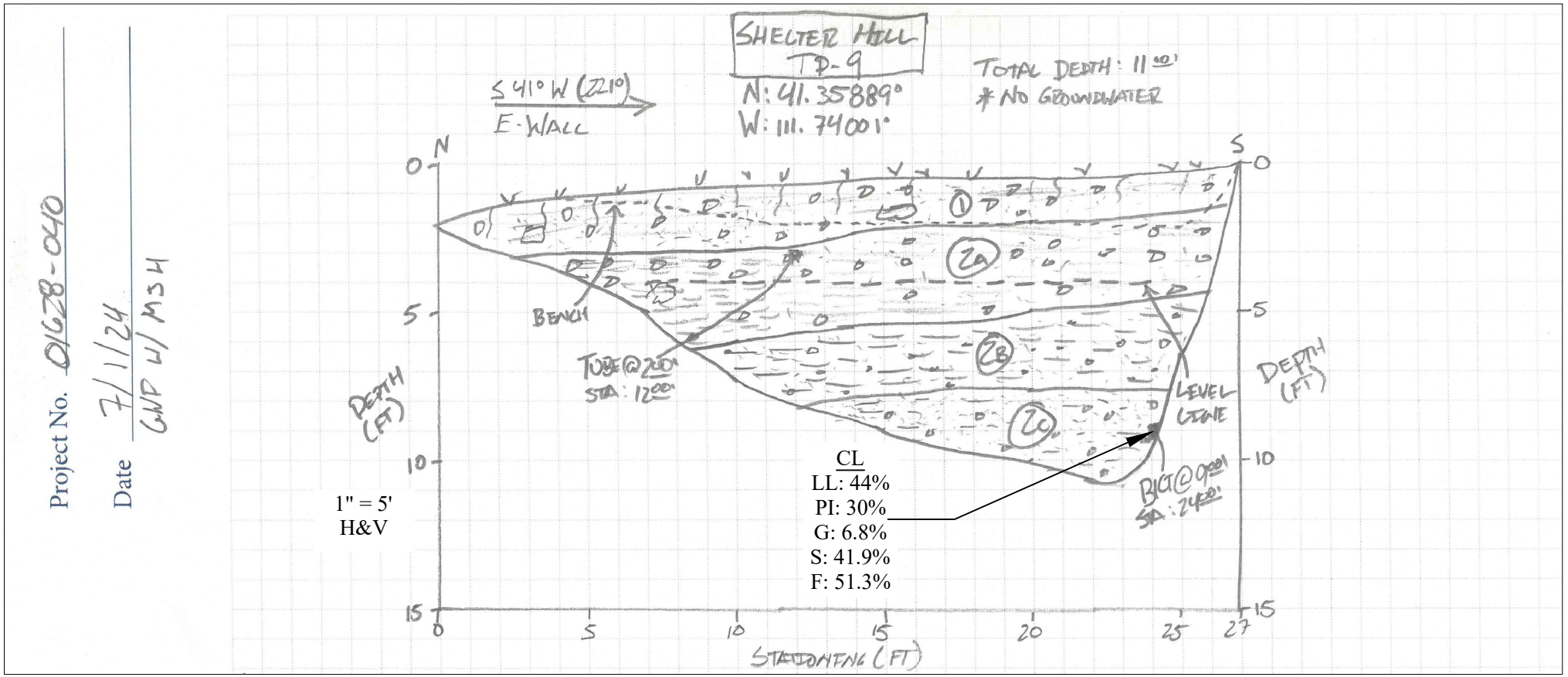
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** ~1.75-2' thick; grayish brown (5Y 3/2) clayey SAND with gravel (SC) grading to sandy lean CLAY with gravel (CL), medium dense, dry, low plasticity fines, massive; gravel and larger sized clasts comprise ~10-15% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~1"; common plant and tree roots; weak stone line at basal contact; sharp, largely planar basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. ~2.5-3' thick; mottled dark reddish brown (10R 3/4) and light brownish gray (5YR 6/1) sandy lean to fat CLAY (CL-CH) grading to clayey sand (SC), medium stiff to stiff, moist, moderate to high plasticity, massive; gravel and larger sized clasts comprise ~10% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, mode ~1-2"; becomes sandier with depth; sand is fine-grained to very fine-grained; few to occasional plant and tree roots; sharp, planar basal contact.

2b. >4' thick; dark reddish brown (10R 3/4) clayey SAND with gravel (SC), dense, wet, moderate plasticity fines, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6" in diameter, mode ~1-2"; sand is medium-grained to coarse-grained; few plant and tree roots.



Lithologic Unit Descriptions

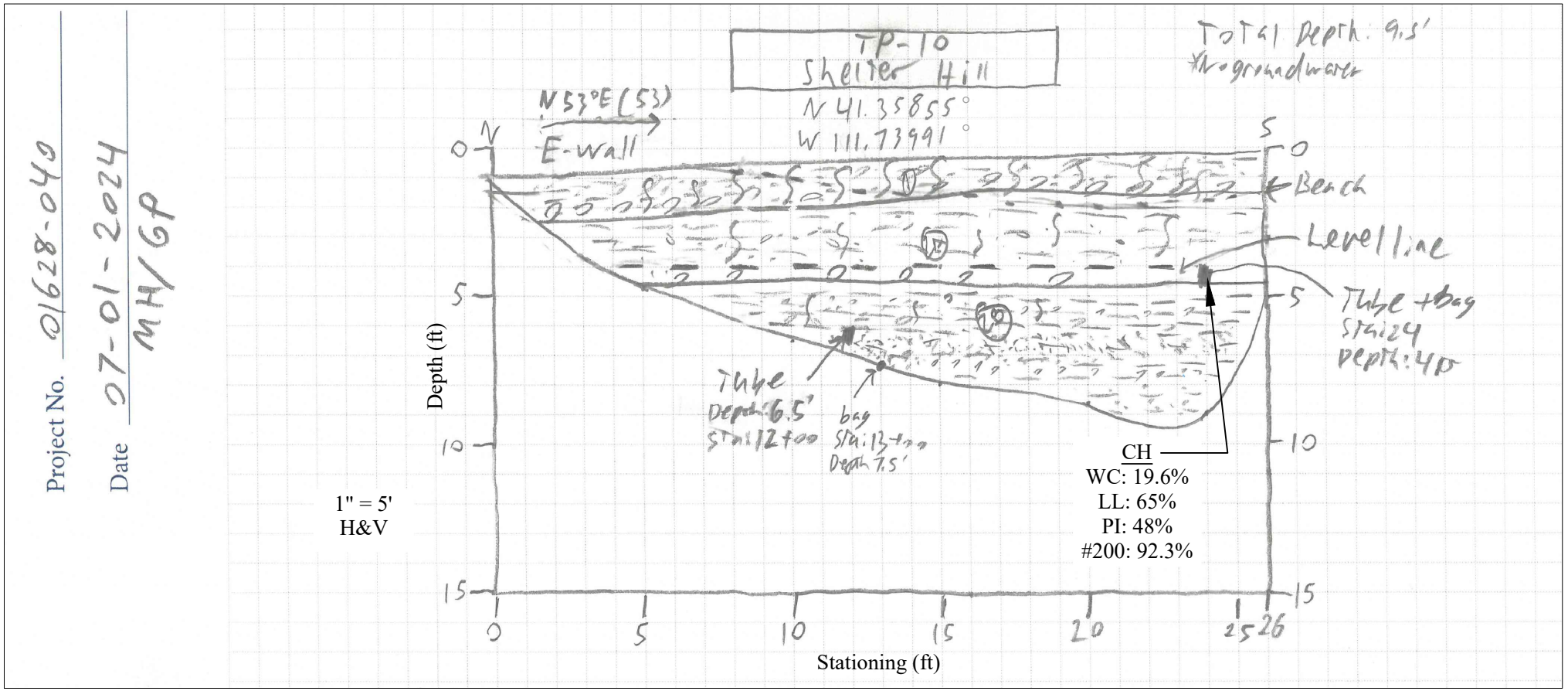
1) **A/B Topsoil/Colluvium (Qc):** Up to 2' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 8" diameter, mode ~1-2"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >9' thick; highly weathered conglomerate bedrock; 3 subunits:

2a. Up to 3' thick; moderate brown (5YR 3/4) to moderate reddish brown (10R 4/6) sandy fat CLAY with gravel (CH), medium stiff to stiff, slightly moist, low to moderate plasticity, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6" in diameter; mode ~1/2-1"; sand component is medium-grained to fine-grained; some slickensides throughout unit, as well as black organics and 1 mm pinholes; sharp, largely planar basal contact.

2b. Up to 3' thick; moderate reddish brown (10R 4/6) mottled with light brown (5YR 6/4) sandy fat CLAY with gravel (CL), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger sized clasts comprise ~10-20% of unit; clasts are angular light brown (5YR 6/4) sandstone and siltstone that have weathered in place; clasts are up to ½" in diameter, mode ~1/8-1/4"; generally matrix-supported, coarsens upward; sand is medium-grained to coarse-grained; abundant calcium carbonate flour throughout unit; sharp, planar basal contact.

2c. >3' thick; moderate reddish brown (10R 4/6) clayey SAND with gravel (SC), loose to medium stiff, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are angular to subangular medium gray (N5) quartzite and weathered sandstone up to 4" in diameter; mode ~1/2-1"; sand component is fine-grained to medium-grained.



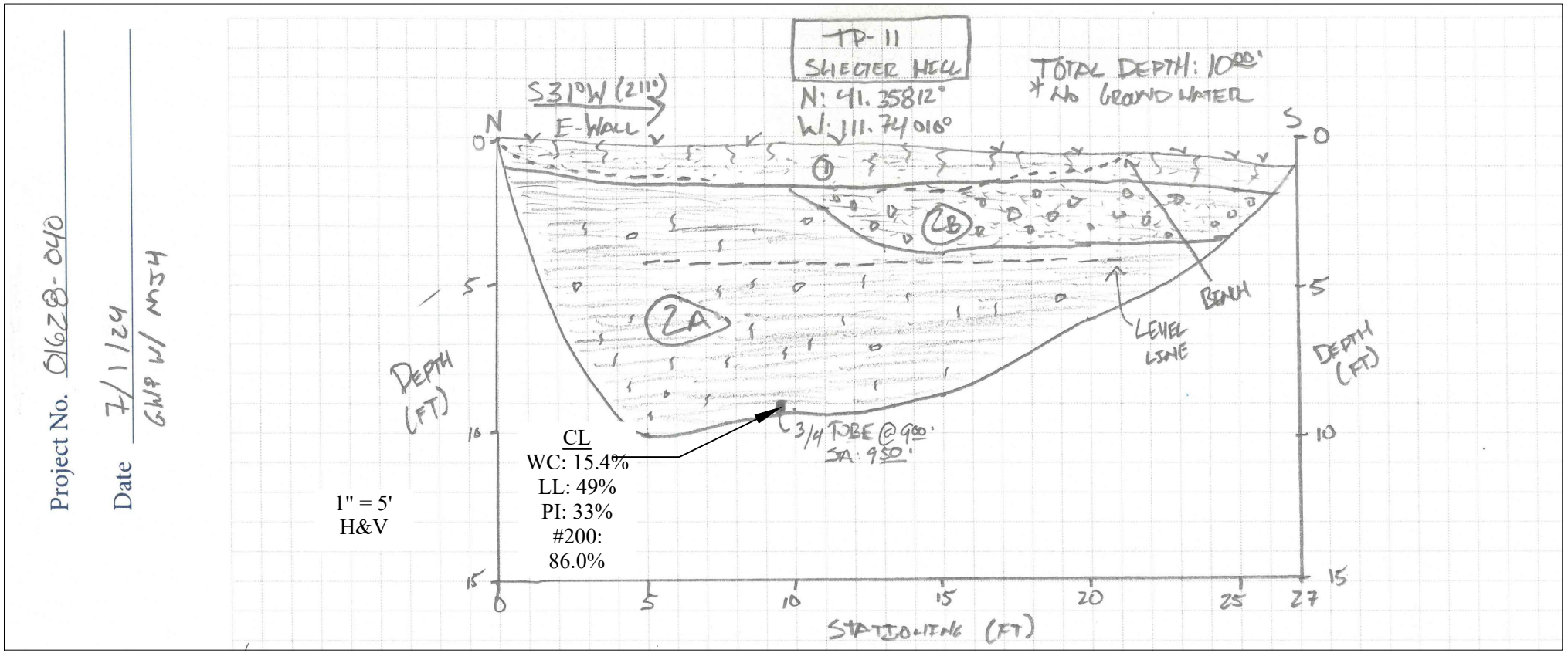
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 1.5' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 9" diameter, mode ~2-4"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >8' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. Up to 3' thick; light brown (5YR 6/4) to moderate reddish orange (10R 6/6) sandy fat CLAY (CH), stiff, slightly moist to moist, moderate plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6" in diameter, mode ~1/2-1"; slickensided in places; occasional plant and tree roots; sand component is fine-grained to medium-grained; sharp, largely planar basal contact.

2b. >5' thick; moderate reddish brown (10R 4/6) mottled with light brown (5YR 6/4) sandy fat CLAY with gravel (CL), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger sized clasts comprise ~10-20% of unit; clasts are angular light brown (5YR 6/4) sandstone and siltstone that have weathered in place; clasts are up to ½" in diameter, mode ~1/8-1/4"; generally matrix-supported, coarsens upward; sand is medium-grained to coarse-grained; few plant and tree roots.



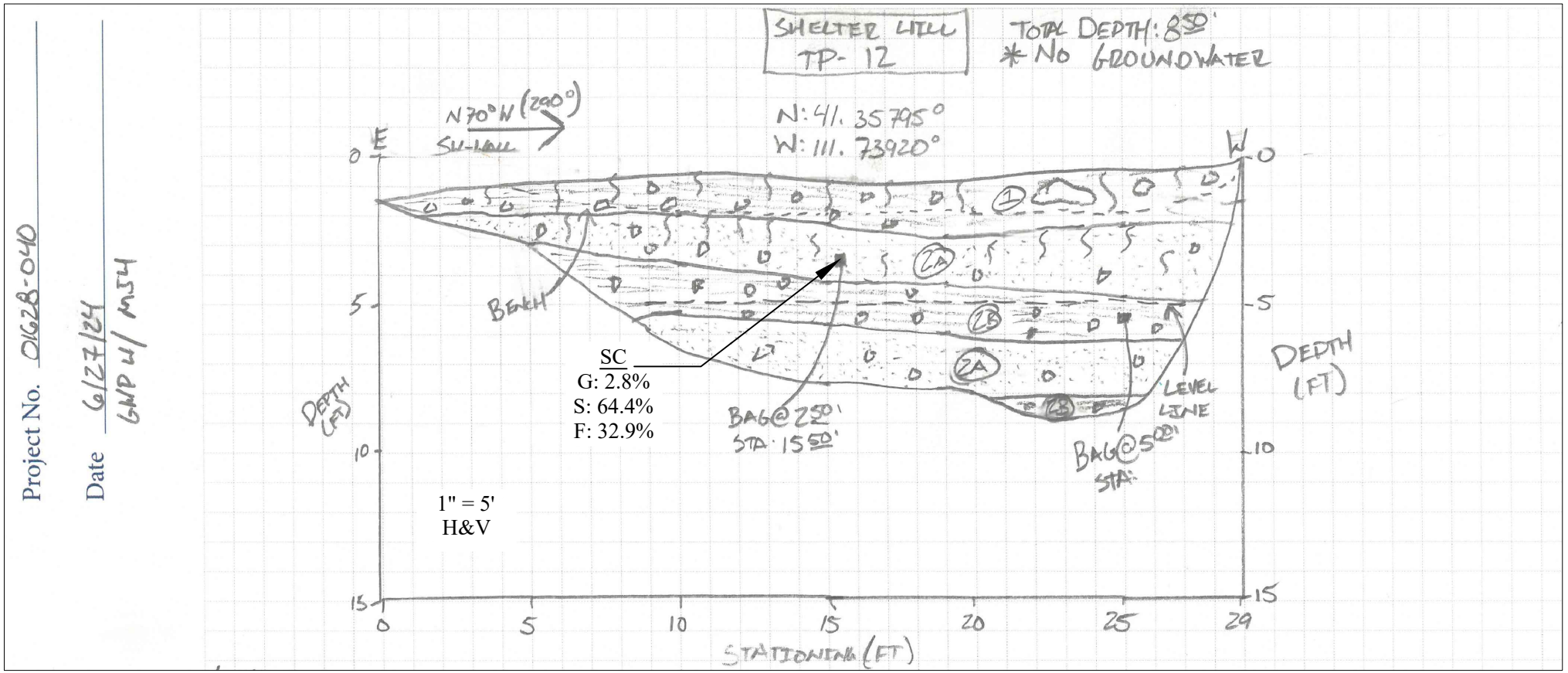
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 1.5' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1' in diameter, mode ~1/2-1.5"; abundant plant and tree roots; sharp, planar basal contact defined by stone line.

2) **Wasatch Formation (Tw):** >8' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. >8' thick; moderate reddish orange (10R 6/6) to light brownish gray (5YR 6/1) fat CLAY (CH), medium stiff to stiff, slightly moist, moderate to high plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1" in diameter, mode ~1/4"; occasional to abundant black organics throughout unit; sharp, curvilinear basal contact.

2b. >2' thick; moderate reddish orange (10R 6/6) to dark yellowish orange (10YR 6/6) clayey SAND with gravel (SC), loose to medium dense, slightly moist, low to moderate plasticity, massive; gravel and larger sized clasts comprise ~25-35% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 8" in diameter, mode ~1/2-1.5"; occasional plant and tree roots and black organics.



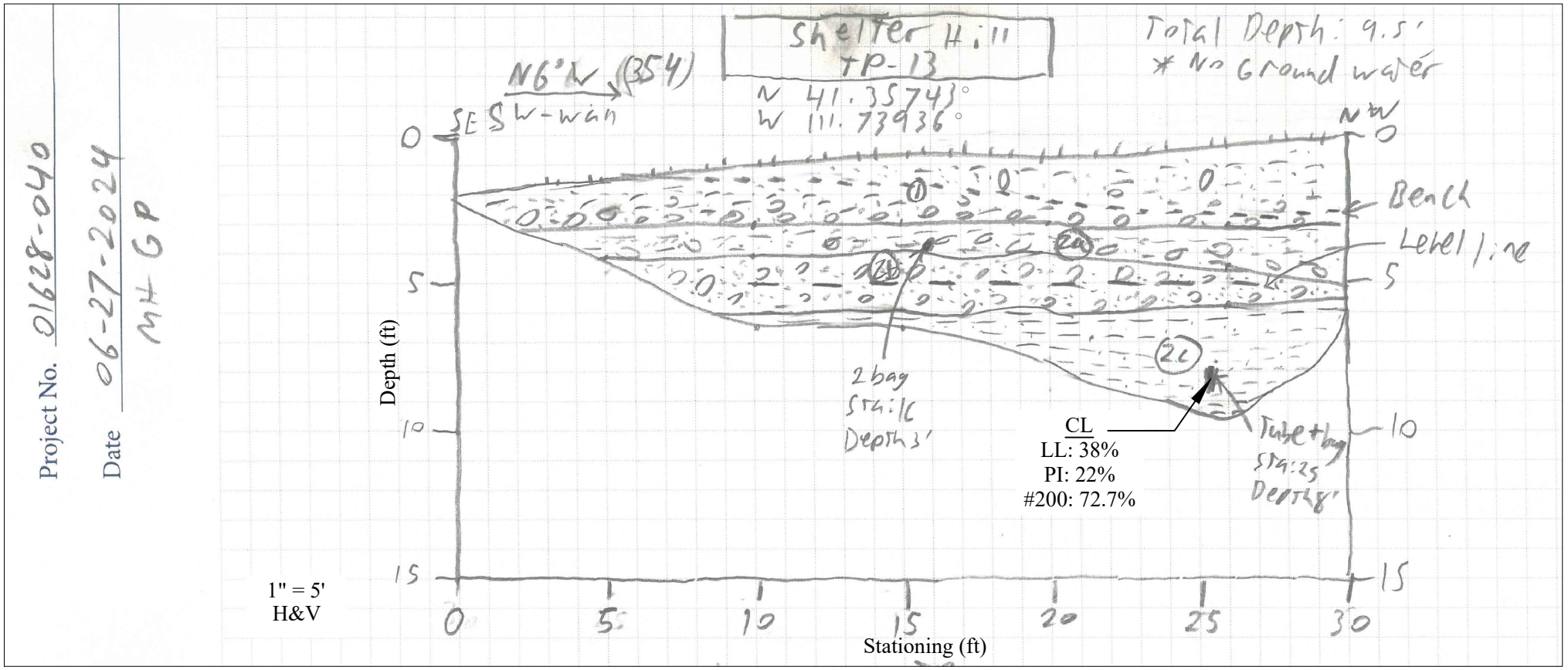
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 1.5' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 3' in diameter, mode ~2-4"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** > 6.5' thick; highly weathered conglomerate bedrock; 2 subunits, repeated, intertonguing beds:

2a. Up to 1.5' thick; moderate brown (5YR ¾) to moderate reddish brown (10R 4/6) poorly-graded SAND with gravel (GP), loose, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subrounded to subangular siltstone and sandstone up to 3" in diameter, mode ~1"; sand component is medium-grained to coarse-grained; some plant roots throughout unit; sharp, irregular basal contact.

2b. Up to 2.5' thick; moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) sandy lean CLAY with gravel (CL), medium stiff to stiff, moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~1/2-1.5"; pockets of clayey sand in places; sand component is medium-grained; common plant and tree roots.



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 3' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 3' in diameter, mode ~2-4"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock; 3 subunits:

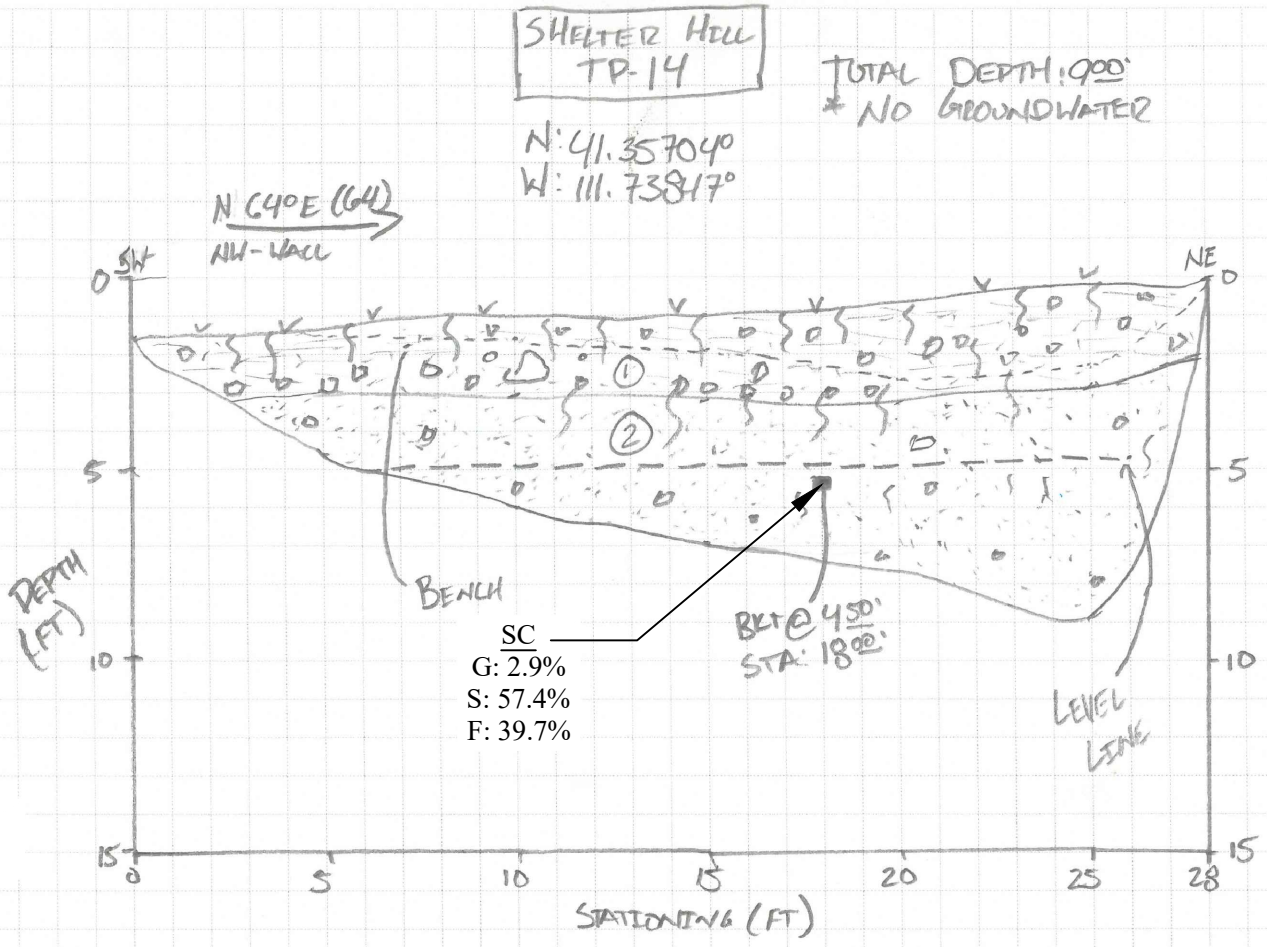
2a. Up to 2' thick; mottled moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) sandy lean CLAY with gravel (CL), medium stiff to stiff, moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~1/2-1.5"; pockets of clayey sand in places; sand component is medium-grained; common plant and tree roots.

2b. Up to 2' thick; pale yellowish orange (10YR 8/6) to light brown (5YR 6/4) poorly-graded SAND with gravel (SP), loose to medium dense, slightly moist to moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~35-45% of unit; clasts are subrounded to subangular sandstone, quartzite, and weathered in place siltstone up to 1' in diameter, mode ~1-3"; clasts decrease in size with depth; occasional plant and tree roots; sharp, wavy basal contact.

2c. >3' thick; moderate reddish orange (10R 6/6) to dark reddish brown (10R 3/4) sandy lean to fat CLAY (CL-CH), stiff, moist, moderate plasticity, massive; devoid of clasts; sand component is medium-grained to coarse-grained.

Project No. 01628-040

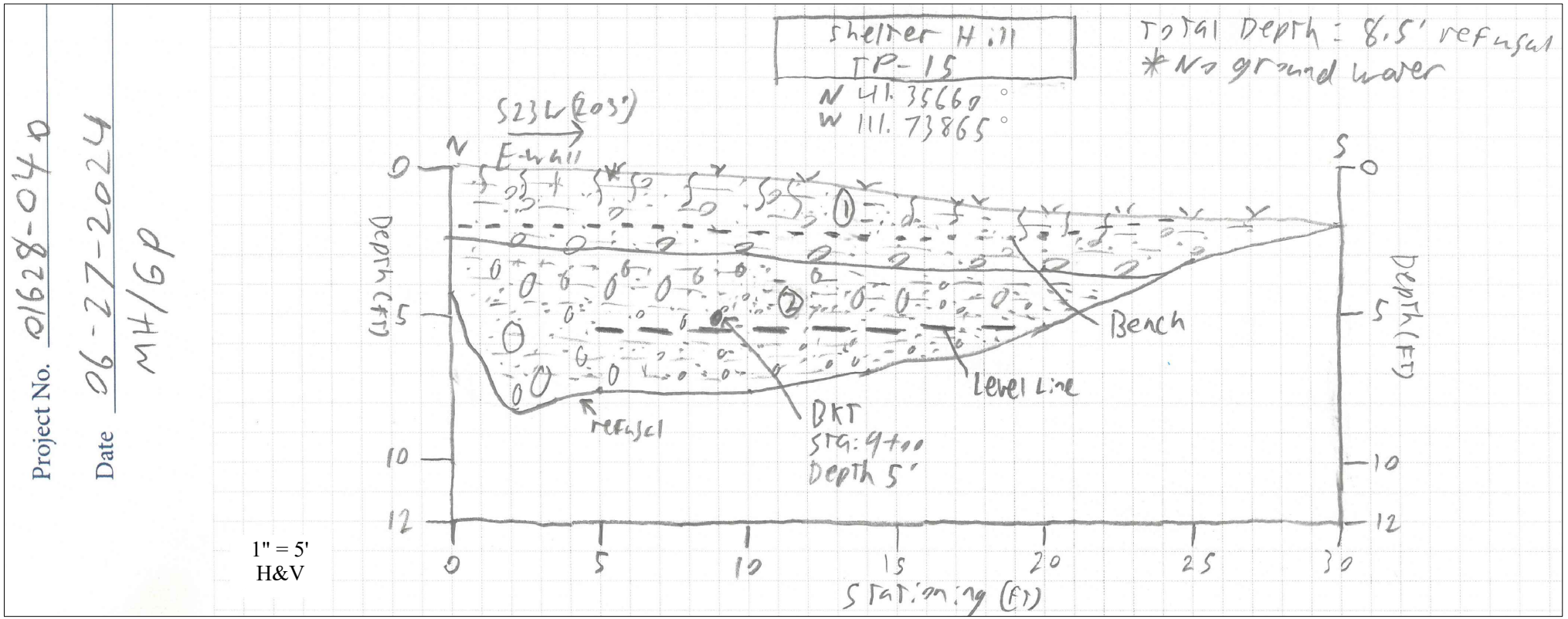
Date 6/27/24 LWP W/ MJH



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 2.75' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2' in diameter, mode ~1/2-1"; abundant plant and tree roots; sharp, irregular basal contact.

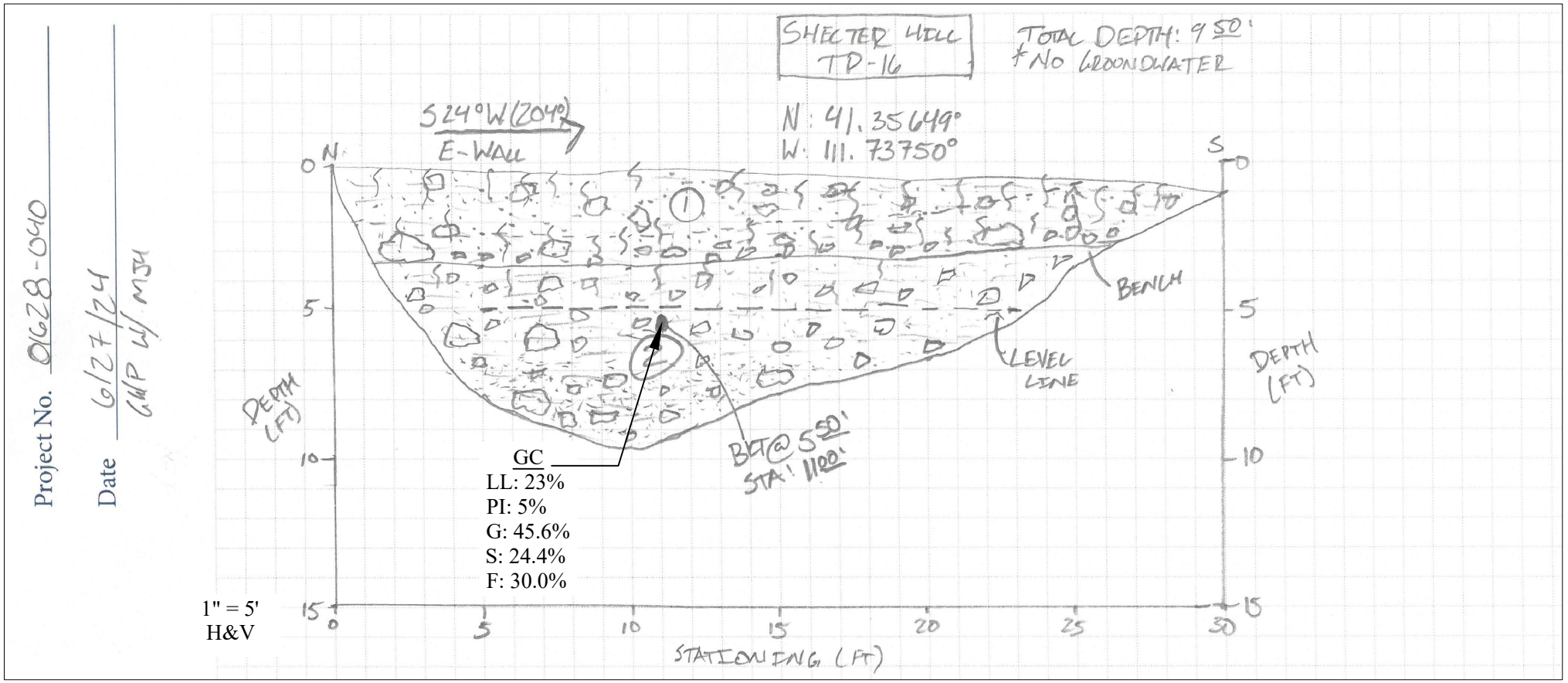
2) **Wasatch Formation (Tw):** >6' thick; highly weathered conglomerate bedrock; moderate reddish brown (10R 4/6) to moderate brown (5YR 3/4) clayey SAND (SC) grading to silty SAND (SM) with depth, loose, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, mode ~1-2; sand component is fine-grained to coarse-grained; common plant roots.



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** 2.5' thick; grayish brown (5Y 3/2) sandy lean CLAY (CL) with gravel grading to clayey GRAVEL (GC) with sand, loose to medium stiff, dry to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1.25' in diameter, mode ~2-4"; abundant plant and tree roots; no distinct stone line, just cobbly throughout; sharp, planar basal contact.

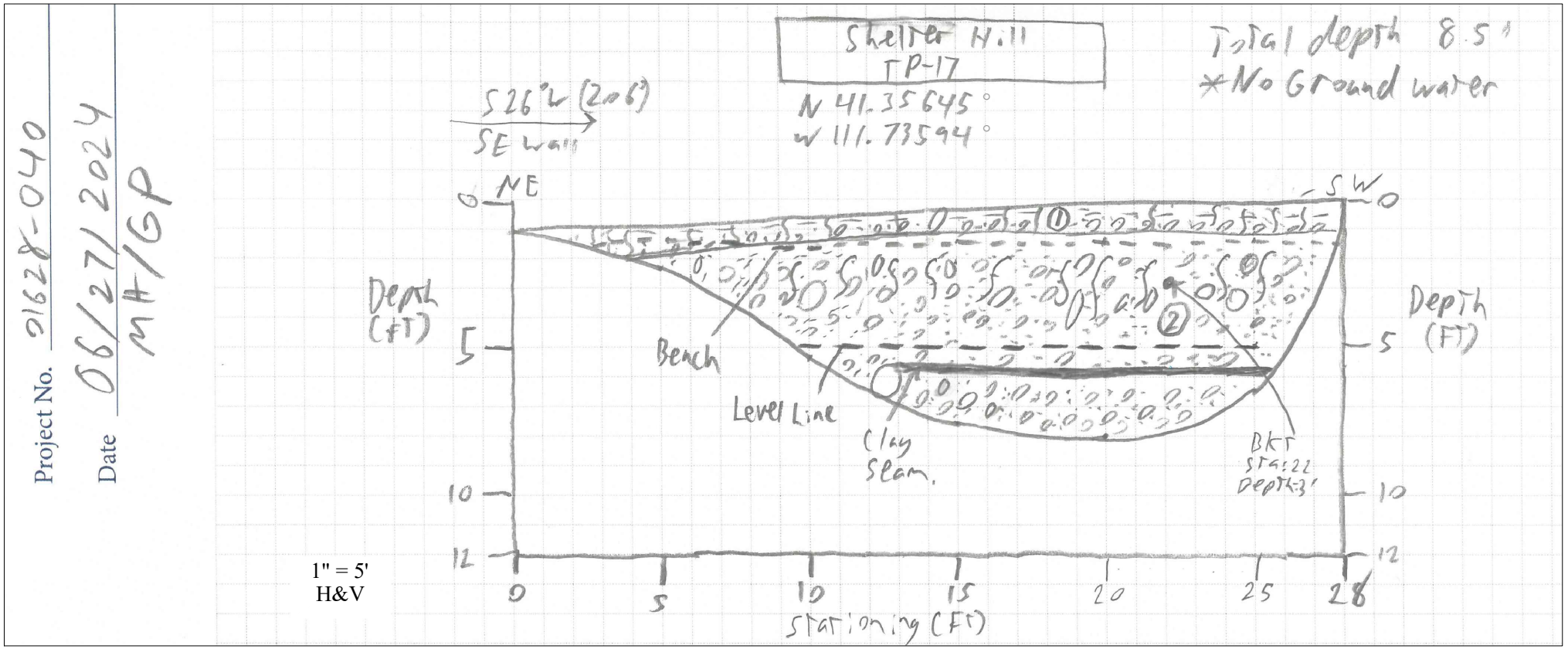
2) **Wasatch Formation (Tw):** >6' thick; highly weathered conglomerate bedrock; moderate reddish orange (10R 6/6) mottled with light brown (5YR 6/4) sandy lean CLAY with gravel (CL) grading to clayey SAND with gravel (SC), medium stiff to very stiff, moist, low to moderate plasticity, massive to weakly bedded; gravel and larger sized clasts comprise ~35-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2.5' in diameter, mode ~1/2-1.5"; gravel grades smaller toward bottom of test pit; sand component is medium-grained to coarse-grained; trace roots.



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 3' thick; grayish brown (5Y 3/2) sandy lean CLAY (CL) with gravel grading to clayey GRAVEL (GC) with sand, loose to medium stiff, dry to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1.25' in diameter, mode ~2-4"; abundant plant and tree roots; distinct stone line at basal contact; sharp, planar basal contact.

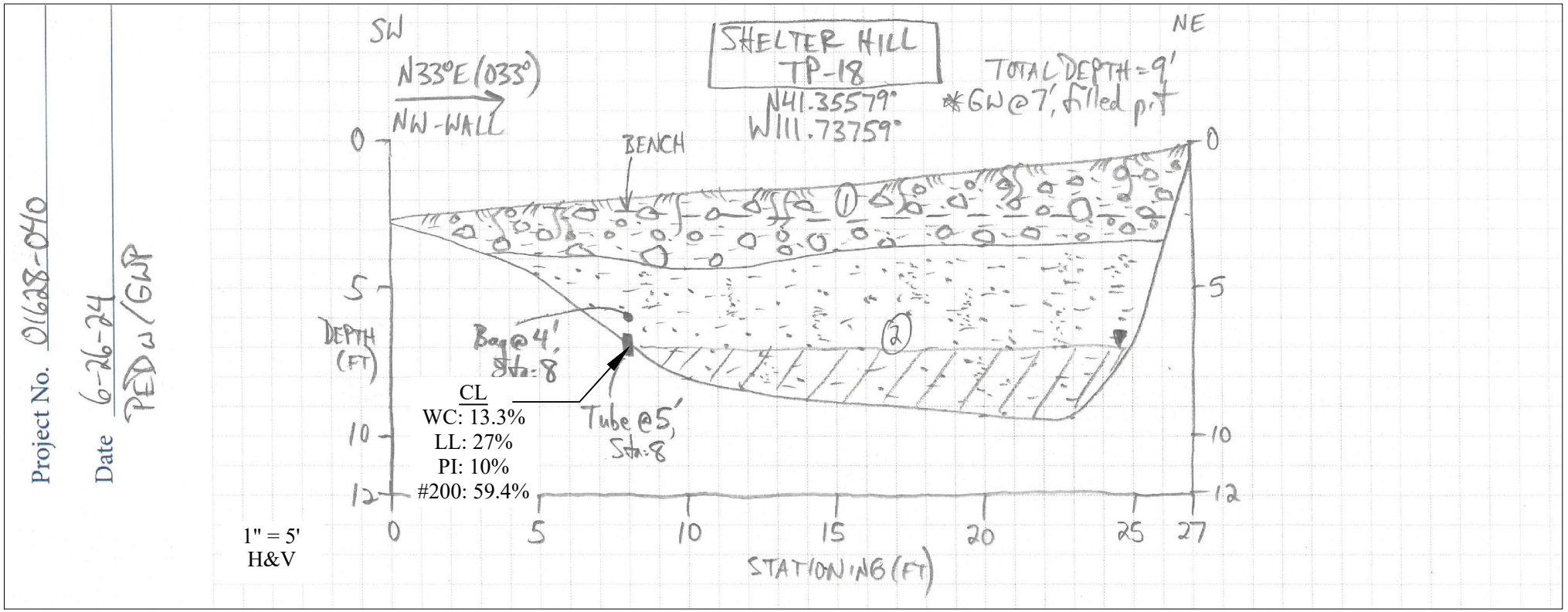
2) **Wasatch Formation (Tw):** >6' thick; highly weathered conglomerate bedrock; moderate reddish brown (10R 4/6) to dark yellowish orange (10YR 6/6) sandy lean CLAY with gravel (CL) grading to clayey SAND with gravel (SC), medium stiff to very stiff, moist, low to moderate plasticity, massive to weakly bedded; gravel and larger sized clasts comprise ~35-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2.5' in diameter, mode ~1/2-1.5"; gravel grades smaller toward bottom of test pit; sand component is fine-grained to medium-grained; trace roots.



Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 1' thick; grayish brown (5Y 3/2) clayey SAND with gravel (SC), medium dense, slightly moist to moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1' in diameter, mode ~1-2"; abundant plant and tree roots; distinct stone line at basal contact; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock; pale yellowish orange (10YR 8/6) to light brown (5YR 6/4) poorly-graded SAND with gravel (SP), loose to medium dense, slightly moist to moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~40-50% of unit; clasts are subrounded to subangular sandstone, quartzite, and weathered in place siltstone up to 2' in diameter, mode ~1-3"; clasts decrease in size with depth; unit includes a dark reddish brown (10R ¾) sandy lean clay seam that is ~2.5" thick and irregularly passes through the test pit; common plant and tree roots.



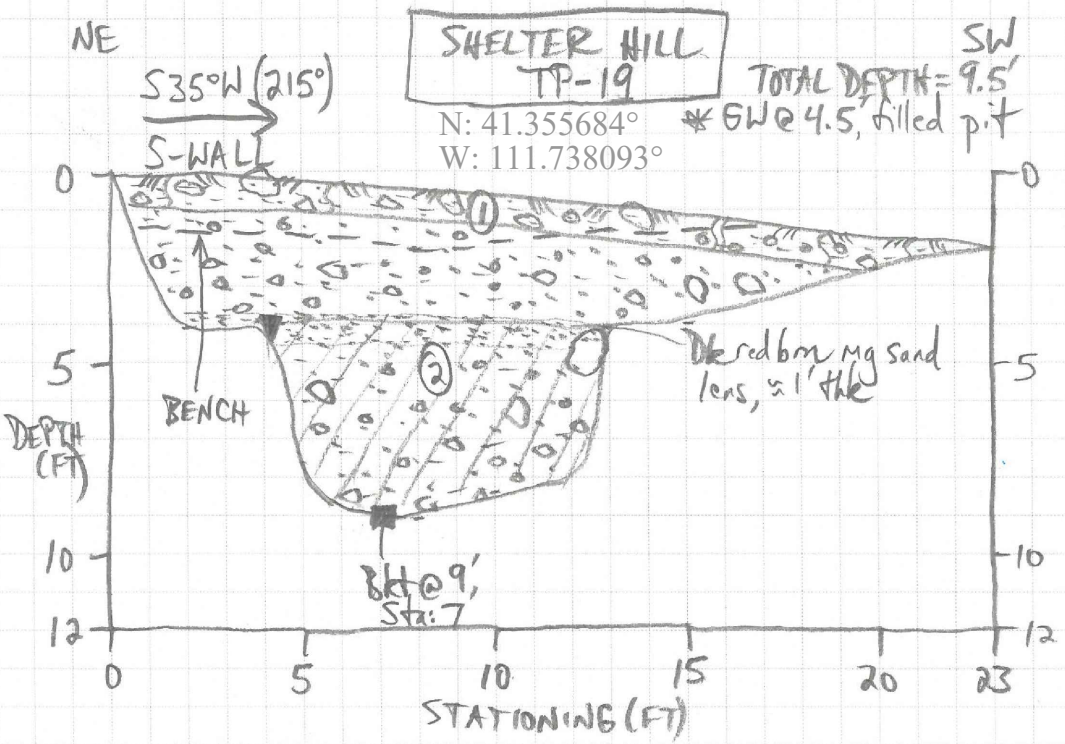
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** ~2-2.75' thick; grayish brown (5Y 3/2) sandy lean CLAY with gravel (CL) grading to clayey GRAVEL with sand (GC), loose to medium stiff, dry to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, mode ~3-5"; abundant plant and tree roots; no distinct stone line, just cobbly throughout; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >6' thick; mottled moderate reddish brown (10R 4/6) and light brownish gray (5YR 6/1) sandy lean CLAY (CL) gradational to clayey SAND (SC), stiff to medium stiff, moist to wet, low to moderate plasticity, massive; devoid of clasts; mottled with light gray (N7) to light brownish gray (5YR 6/1) fine-grained sand in irregular subvertical lenses, usually associated with tree roots; calcium carbonate mottling along root traces near base of test pit; sand is fine-grained to very fine-grained; occasional to few plant and tree roots.

Project No. 01628-040

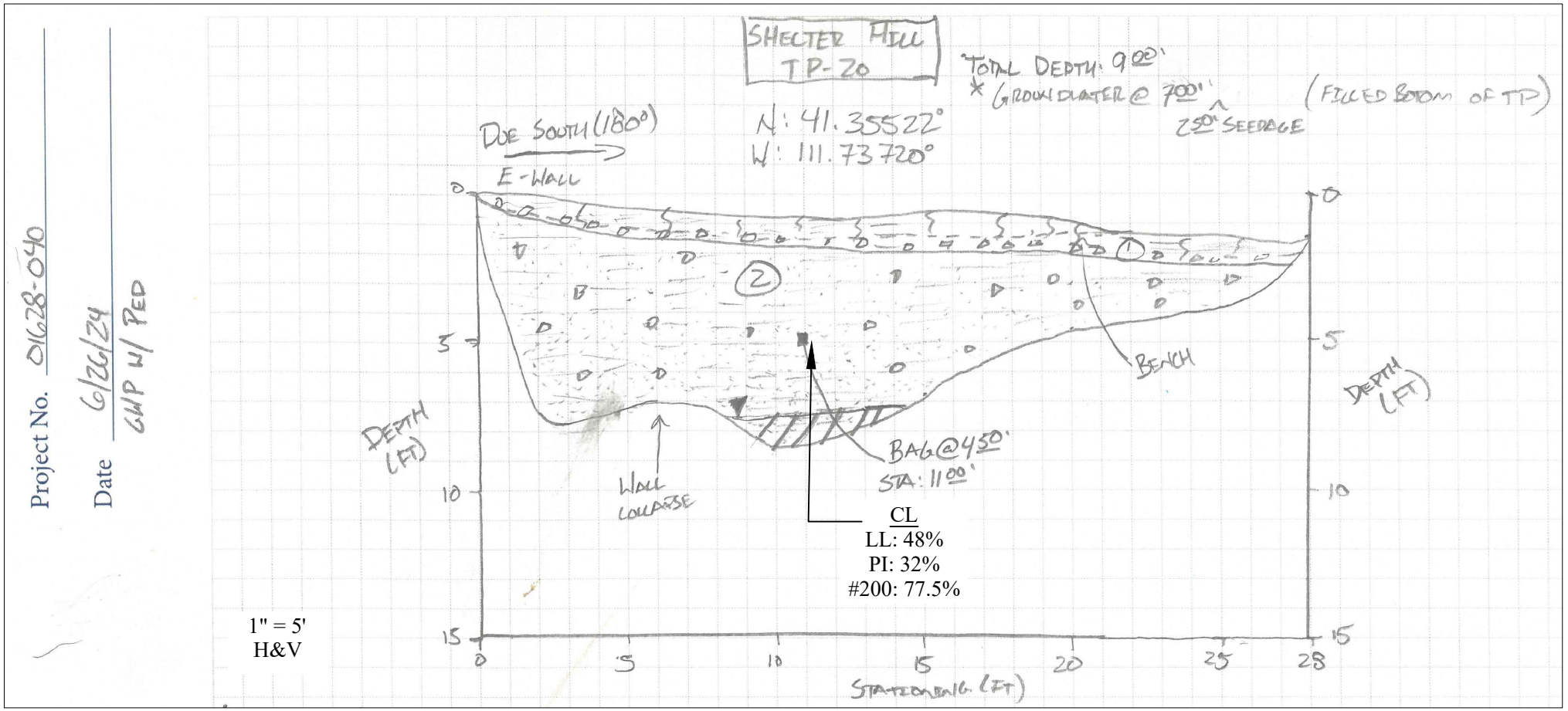
Date 6-26-24 PED w/GMP



Lithologic Unit Descriptions

1) **A/B Topsoil:** ~1' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2' in diameter, mode ~1/2-1"; forming on underlying Wasatch Formation; abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >8 thick; moderate reddish brown (10R 4/6) to moderate reddish orange (10R 6/6) clayey SAND with gravel (SC) grading to clayey GRAVEL with sand (GC), dense to medium dense, wet, low to moderate plasticity fines, massive to medium bedded; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subrounded to rounded to subangular medium gray (N5) to light gray (N7) to purple quartzite and angular dark gray (N3) siltstone up to 3' in diameter, mode ~4-6"; sand is fine-grained to medium-grained; medium-grained coarse-grained sand lens in middle of unit heavily water bearing; more clayey in uppermost ~2' of unit.

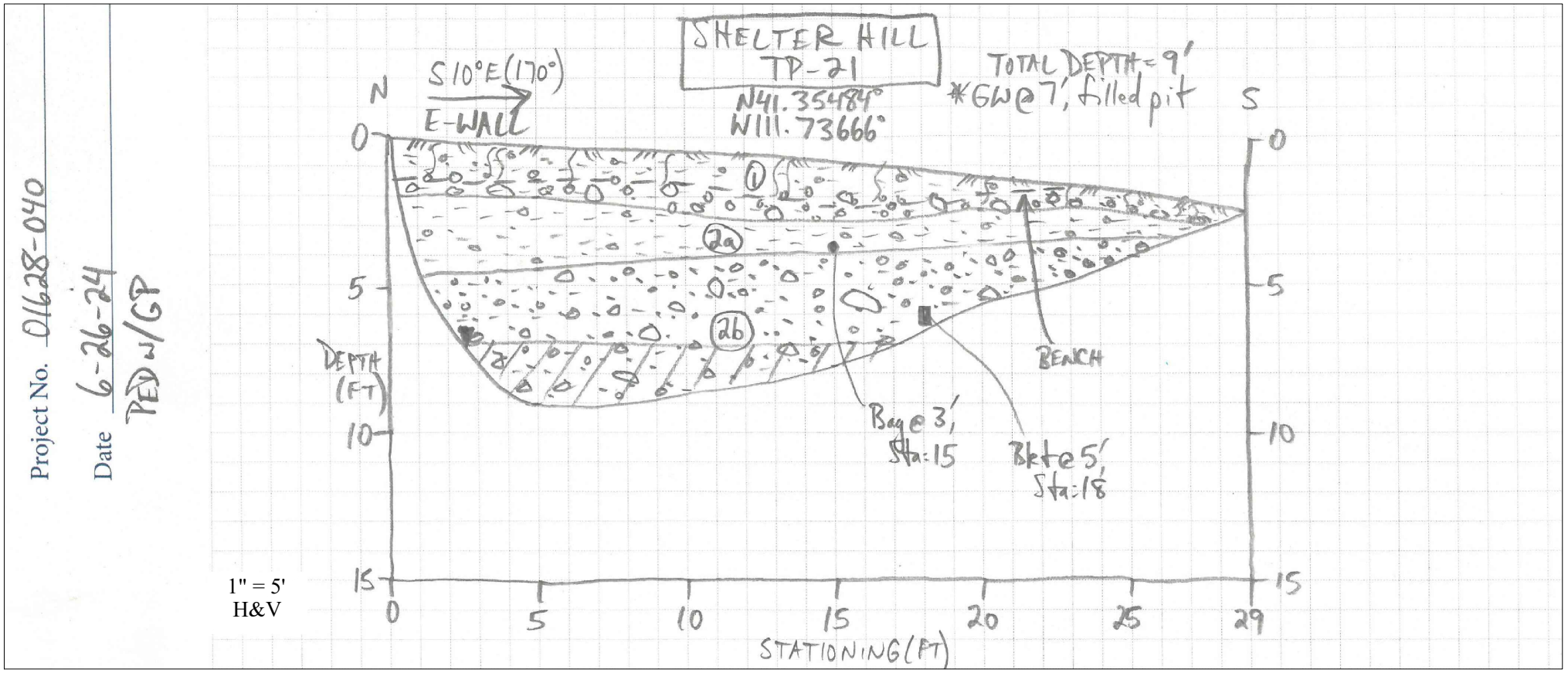


Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 1.5' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2' in diameter, mode ~1/2-1"; stone line along basal contact; abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >6' thick; mottled moderate reddish brown (10R 4/6) and pale brown (5YR 5/2) sandy fat CLAY with gravel (CH), medium stiff to stiff, wet, moderate to high plasticity, massive to weakly bedded; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~1/2-1"; sand component is fine-grained to medium-grained; common plant and tree roots.

*Major sluffing/collapse of sidewalls, logged outside of trench.



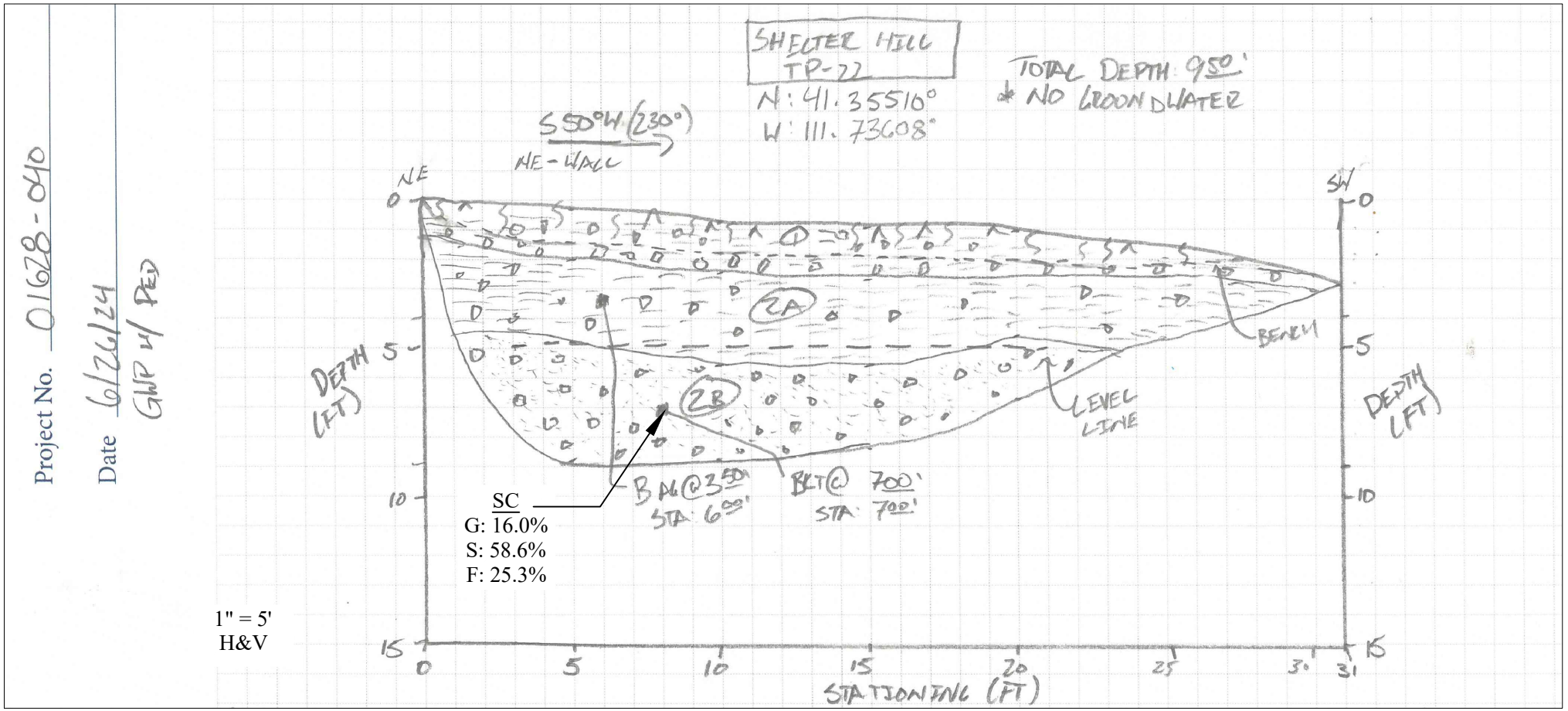
Lithologic Unit Descriptions

1) A/B Topsoil/Colluvium (Qc): 1-2' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 10" in diameter, mode ~3-4"; stone line in basal ~1' of unit with ~50% gravel and larger sized clasts; abundant plant and tree roots; sharp, irregular basal contact.

2) Wasatch Formation (Tw): >7' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. Up to 2.5' thick; moderate reddish brown (10R 4/6) sandy fat CLAY with gravel (CH), stiff to very stiff, moist, high plasticity, massive; gravel and larger sized clasts comprise ~15-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~2-3"; slickensided in places, and brownish gray (5YR 4/1) where slickensided; thins to south; common to abundant plant and tree roots; sharp, planar basal contact.

2b. >4.5' thick; moderate reddish brown (10R 4/6) to moderate reddish orange (10R 6/6) clayey GRAVEL with sand (GC) grading to clayey SAND with gravel (SC), dense, moist to wet, moderate plasticity fines, massive; gravel and larger sized clasts comprise ~40% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, mode ~3-5"; occasional plant and tree roots.



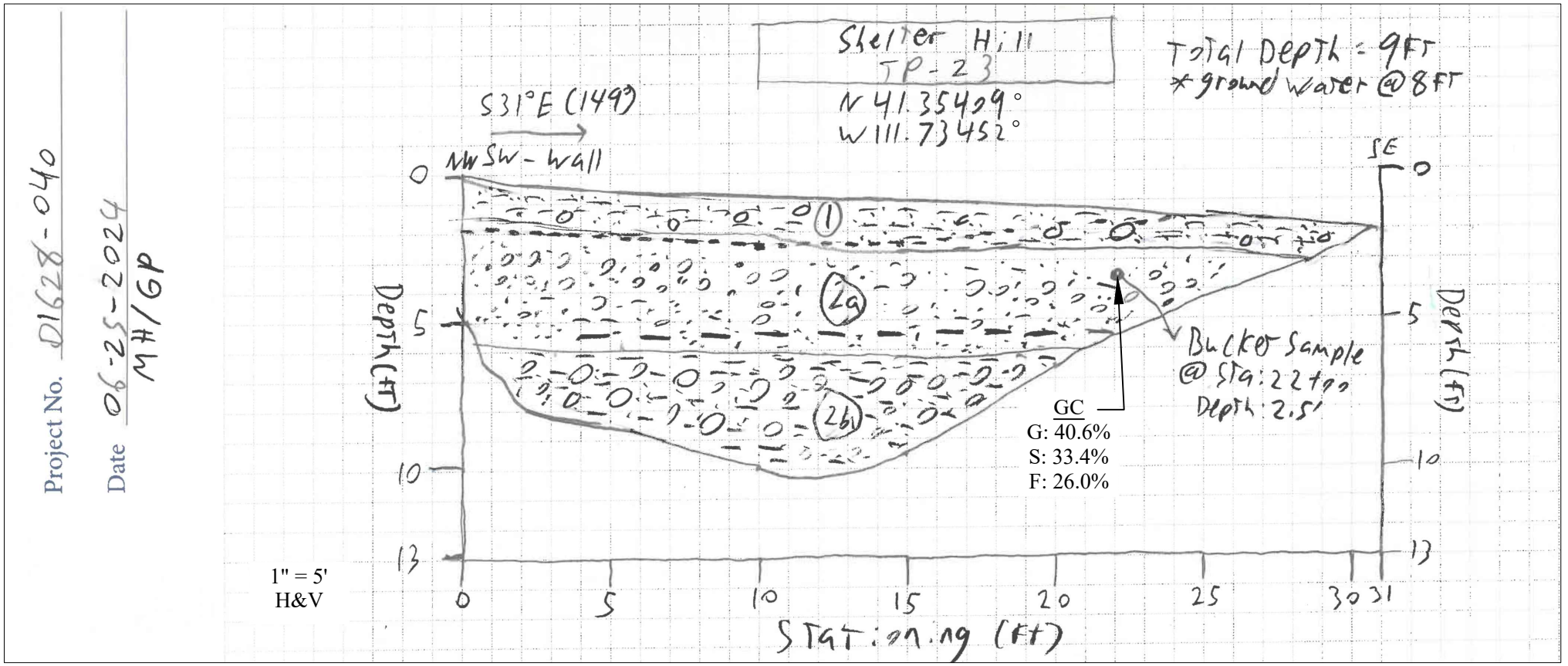
Lithologic Unit Descriptions

1) **A/B Topsoil/Colluvium (Qc):** Up to 2' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 10" in diameter, mode ~3-4"; stone line in basal ~1' of unit with ~50% gravel and larger sized clasts; abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. Up to 3.5' thick; moderate reddish brown (10R 4/6) mottled with light brownish gray (5YR 6/1) and light gray (N7) sandy fat CLAY with gravel (CH), stiff to very stiff, moist, high plasticity, massive; gravel and larger sized clasts comprise ~15-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~2-3"; abundant slickensides and brownish gray (5YR 4/1) where slickensided; occasional pinholes <1mm diameter; common to abundant plant and tree roots; sharp, wavy basal contact.

2b. >3.5' thick; moderate reddish brown (10R 4/6) poorly-graded SAND with gravel (SP), loose to medium dense, slightly moist, moderate plasticity fines, massive to weakly bedded; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 12" in diameter, mode ~1-2"; sand component is medium-grained to coarse-grained; some silty lean clay lenses; occasional plant and tree roots.



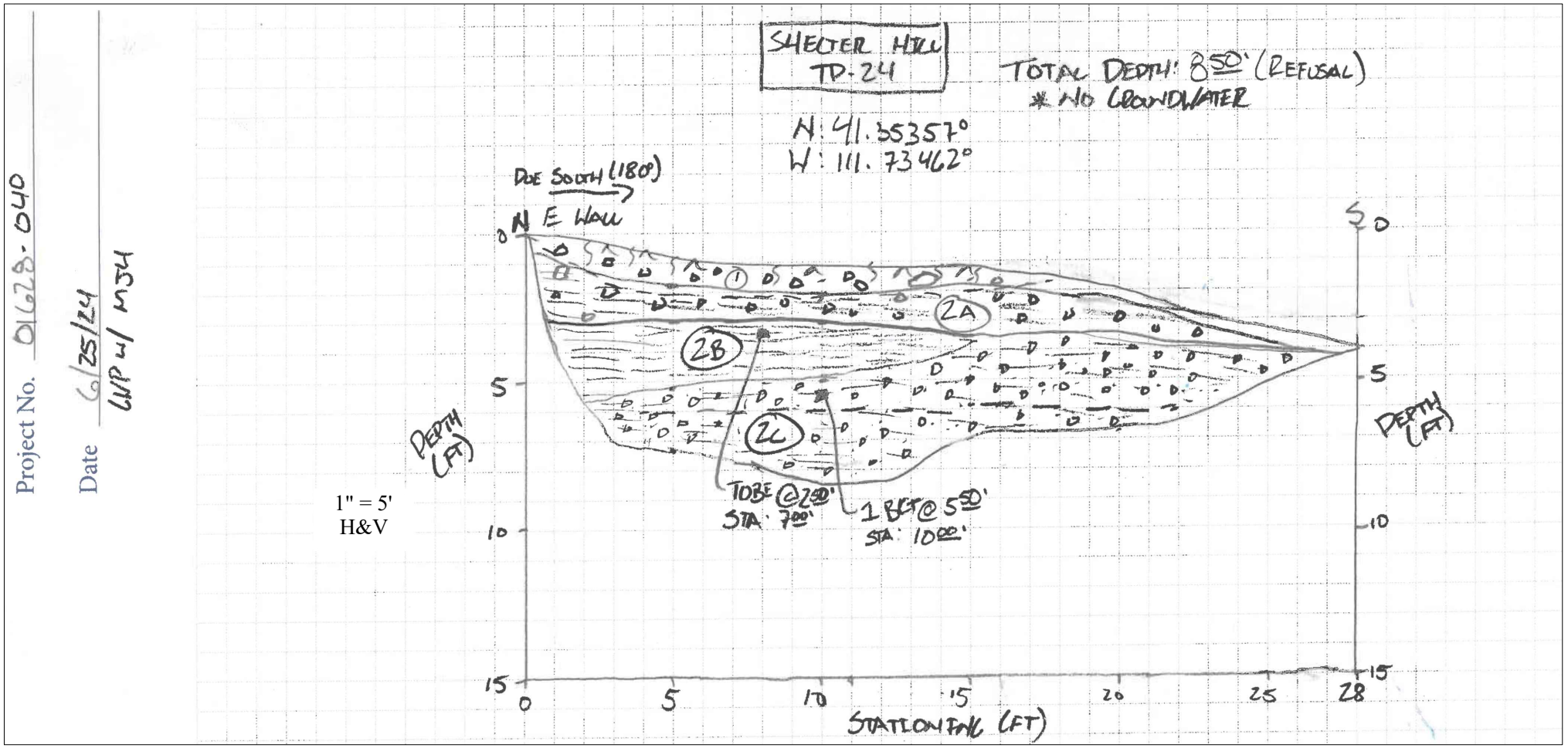
Lithologic Unit Descriptions

1) **A/B Topsoil:** Up to 1.5' thick; grayish brown (5Y 3/2) sandy lean CLAY (CL), loose to medium dense, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2.5' diameter, mode ~1-2"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >8' thick; highly weathered conglomerate bedrock; 2 subunits:

2a. Up to 4' thick; mottled moderate reddish orange (10R 6/6) and moderate reddish brown (10R 4/6) silty SAND with gravel (SM) grading to clayey SAND with gravel (SC), medium dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~45-55% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 6" in diameter, mode ~2-4"; sand component is fine-grained to coarse-grained; trace plant and tree roots; gradational, irregular basal contact.

2b. >4' thick; moderate reddish brown (10R 4/6) mottled with light brown (5YR 6/4) sandy lean CLAY with gravel (CL) grading to clayey SAND with gravel (SC), medium stiff to stiff, moist to wet, moderate plasticity, massive; gravel and larger sized clasts comprise ~40-60% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 12" in diameter, mode ~4-6"; sand component is fine-grained to medium-grained.



Lithologic Unit Descriptions

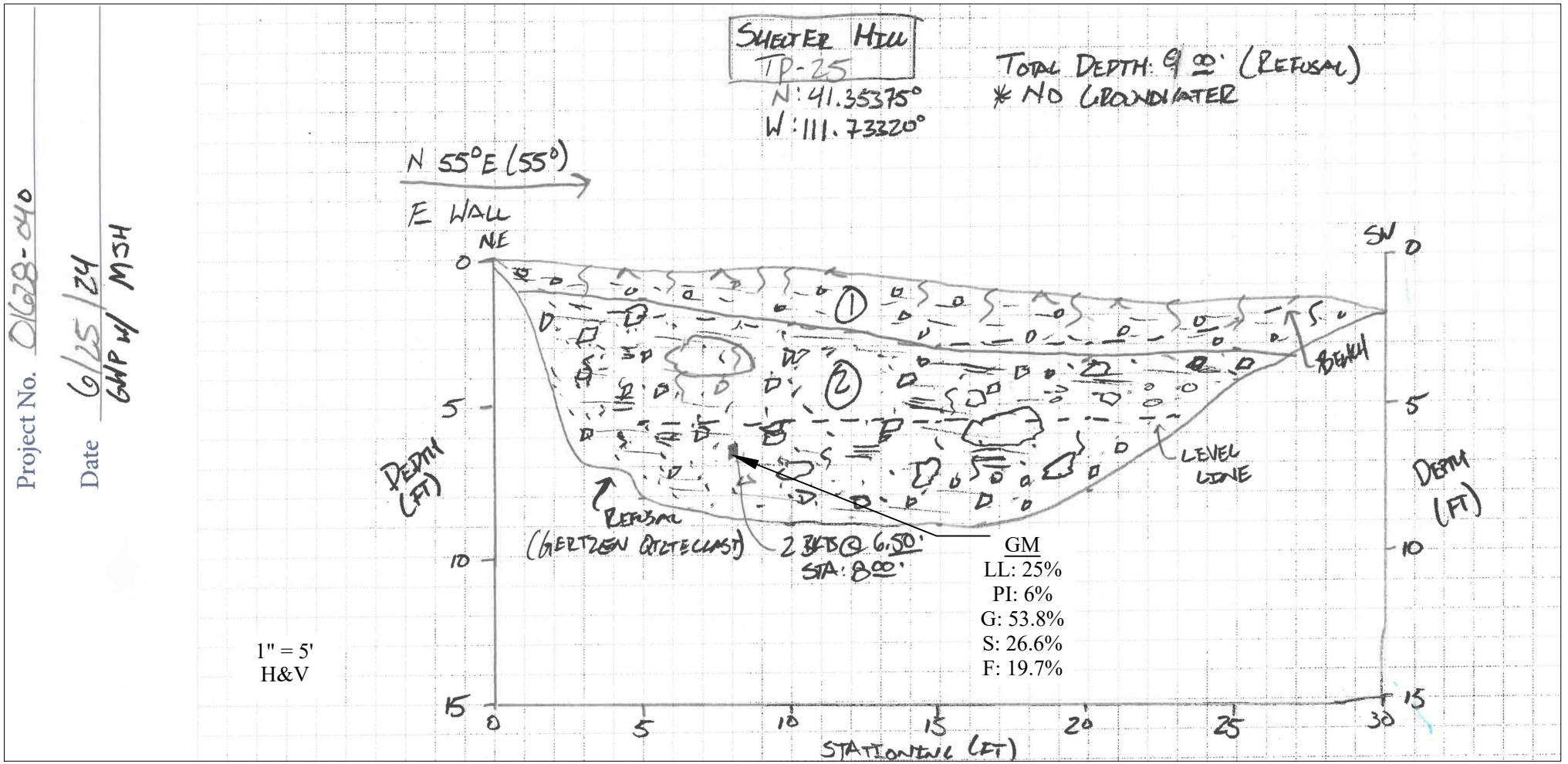
1) **A/B Topsoil:** Up to 1' thick; grayish brown (5Y 3/2) sandy lean CLAY (CL), loose to medium dense, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 12" diameter, mode ~2-4"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >7.5' thick; highly weathered conglomerate bedrock; 3 subunits:

2a. Up to 2.5' thick; moderate reddish orange (10R 6/6) to pale red (10R 6/2) sandy lean CLAY with gravel (CL), medium stiff, slightly moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 3" in diameter, mode ~1/2-1"; sharp, irregular basal contact.

2b. Up to 2.5' thick; dark reddish brown (10R ¾) to moderate reddish orange (10R 6/6) sandy fat CLAY (CH), stiff to very stiff, moist, moderate to high plasticity, massive; devoid of clasts; trace roots; sharp, curvilinear basal contact.

2c. >4' thick; moderate reddish brown (10R 4/6) mottled with light brown (5YR 6/4) sandy lean CLAY with gravel (CL) grading to clayey GRAVEL with sand (GC), medium stiff to stiff, slightly moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~40-60% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2" in diameter, mode ~1/2-1".



Lithologic Unit Descriptions

1) **A/B Topsoil:** ~2-2.5' thick; grayish brown (5Y 3/2) clayey SAND with gravel (SC), loose, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~15-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 2.5' in diameter, mode ~1-2"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >7' thick; highly weathered conglomerate bedrock; mottled grayish brown (5Y 3/2) to moderate reddish orange (10R 6/6) clayey SAND with gravel (SC) grading to poorly-graded SAND with gravel (SP), medium dense to dense, slightly moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~40-60% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 3' in diameter, mode ~3-6"; occasional plant and tree roots.

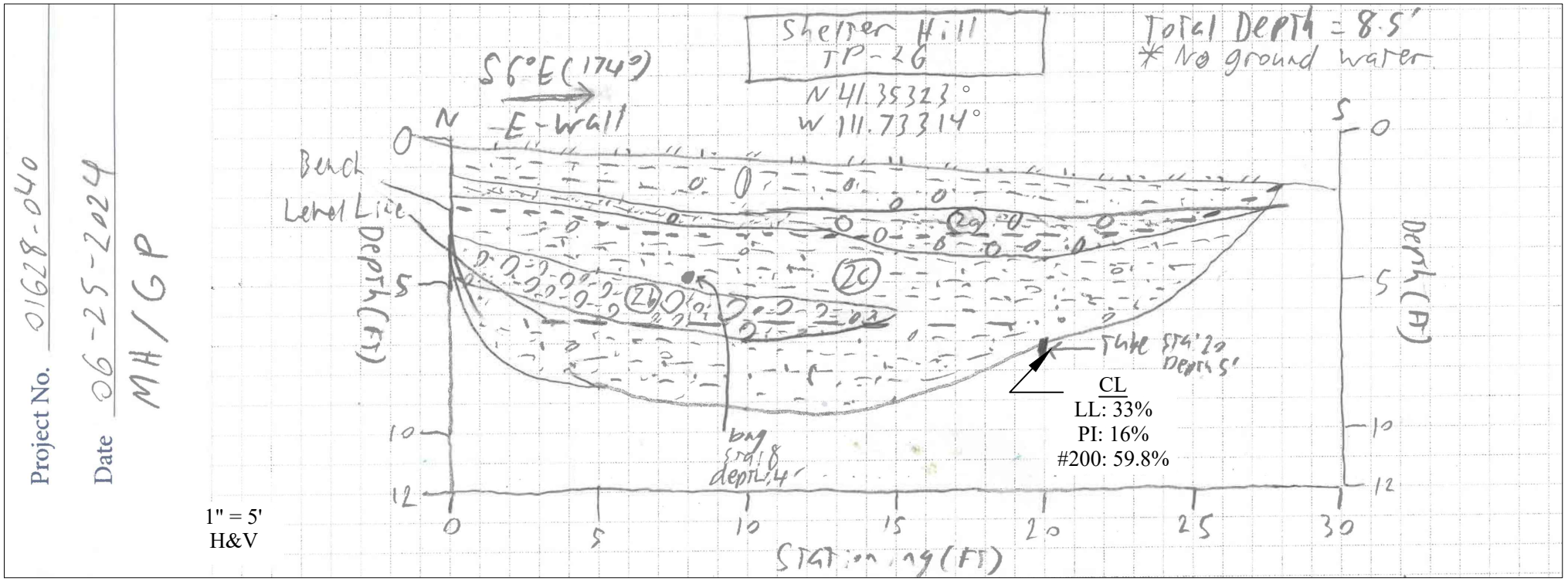
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

TP-25 Log

Figure

A-30



Lithologic Unit Descriptions

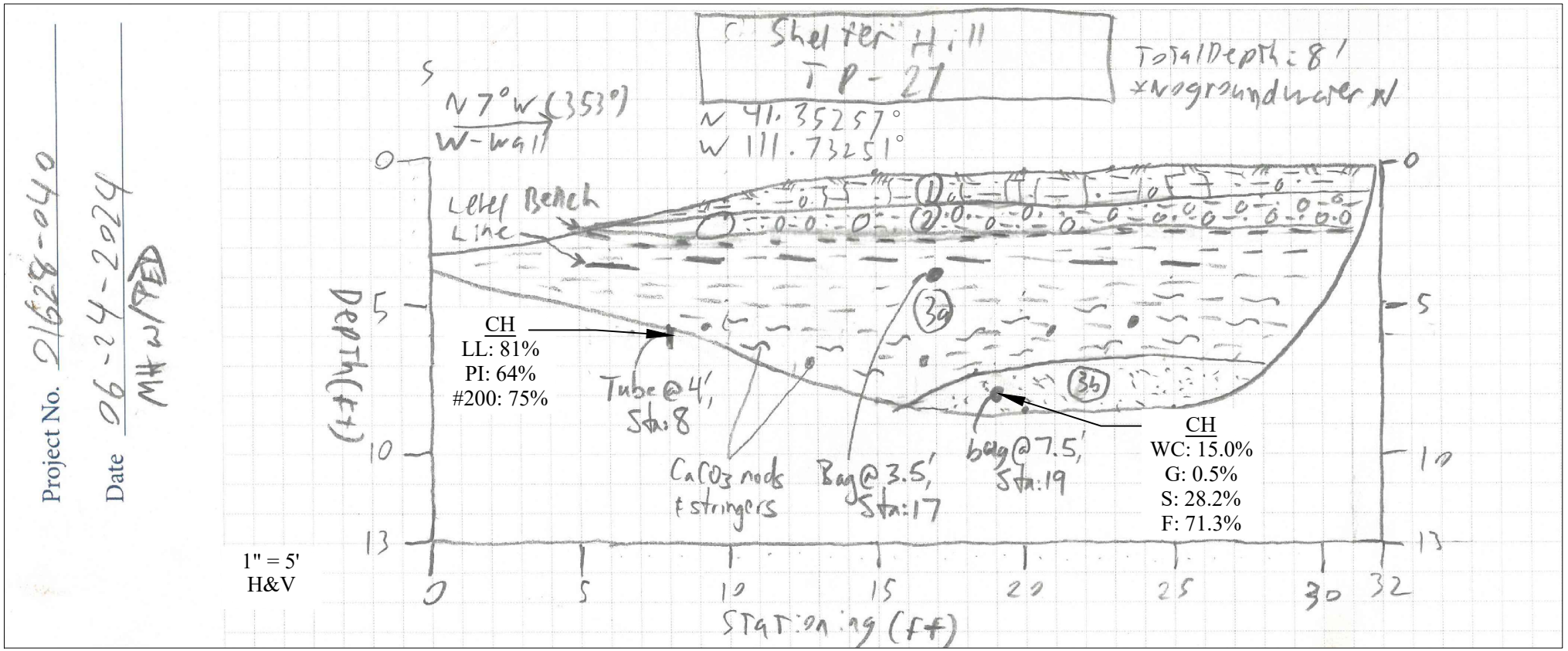
1) **A/B Topsoil:** Up to 1.5' thick; grayish brown (5Y 3/2) sandy lean CLAY (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1" in diameter, mode ~1/2"; abundant plant and tree roots; sharp, irregular basal contact.

2) **Wasatch Formation (Tw):** >8' thick; highly weathered conglomerate bedrock; 3 subunits:

2a. Up to 1.5' thick; pale reddish brown (10R 5/4) silty SAND with gravel (SM), medium dense, moist to slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~25-35% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 12" in diameter, mode ~1-2"; abundant plant and tree roots; sharp, irregular basal contact.

2b. Up to 1.5' thick; moderate reddish orange (10R 6/6) to moderate yellowish brown (10YR 5/4) silty GRAVEL (GM) grading to clayey GRAVEL (GC), medium dense, moist, low to moderate plasticity fines, massive; gravel and larger sized clasts comprise ~55-65% of unit; clasts are subangular to subrounded quartzite and sandstone up to 6" in diameter, mode ~2"; gradational, curvilinear basal contact.

2c. >5' thick; mottled moderate reddish brown (10R 4/6) and moderate yellowish brown (10YR 5/4) sandy lean CLAY (CL) grading to clayey SAND with gravel (SC), medium stiff to stiff, moist, moderate plasticity, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are subrounded to subangular medium gray (N5) quartzite and sandstone up to 2" in diameter, mode ~1-2"; trace plant and tree roots.



Lithologic Unit Descriptions

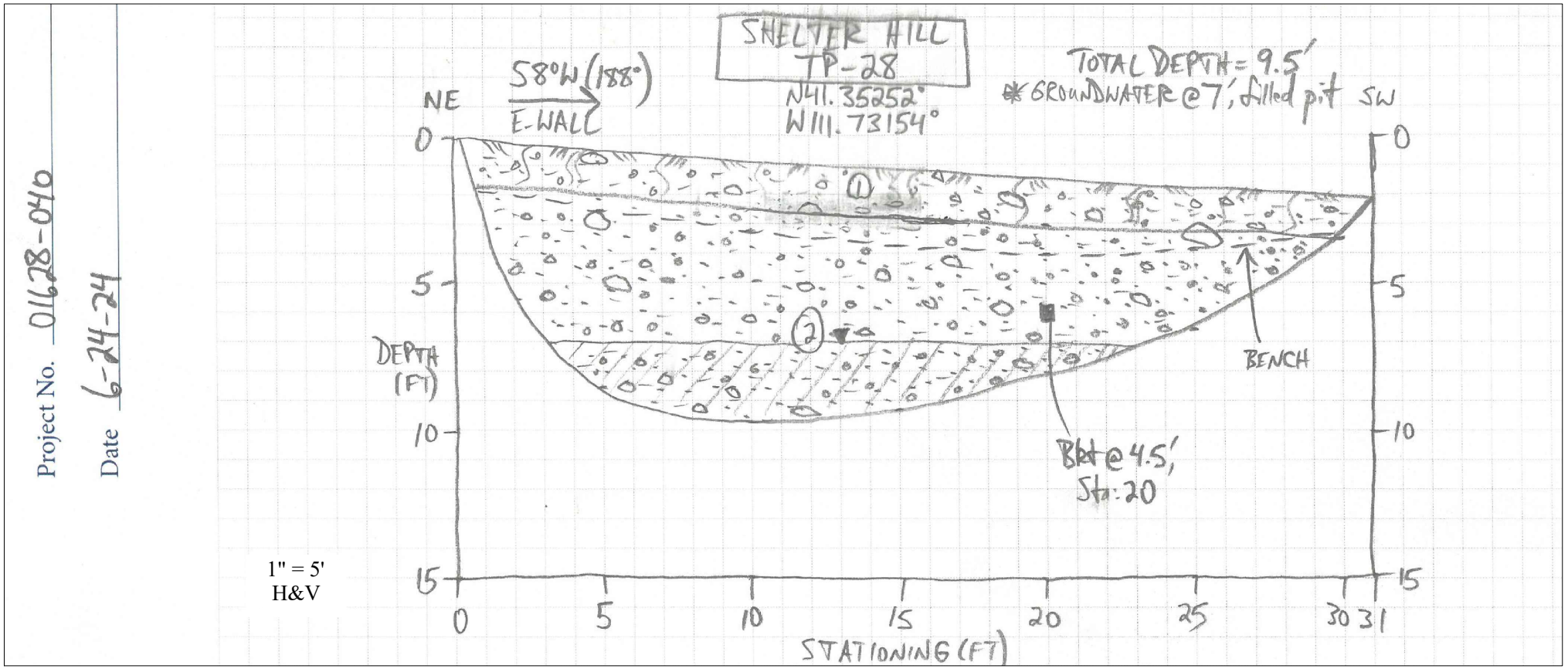
1) A/B Topsoil: 1' thick; brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), medium stiff, slightly moist to moist, low plasticity, massive; gravel and larger sized clasts comprise ~10-20% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1.5" in diameter, mode ~3/4"; abundant plant and tree roots; gradational, irregular basal contact.

2) Colluvium (Qc): 1' thick; brownish gray (5YR 4/1) clayey GRAVEL (GC), medium dense, moist, moderate plasticity fines, massive; gravel and larger sized clasts comprise ~50-65% of unit; clasts are subangular to subrounded quartzite up to 1.5' in diameter, mode ~3-6"; abundant plant and tree roots; sharp, planar basal contact.

1) Wasatch Formation (Tw): >7' thick; highly weathered conglomerate bedrock; 2 subunits:

3a. ~5-5.75' thick; dark reddish brown (10R ¾) to moderate reddish orange (10R 6/6) sandy fat CLAY (CH), stiff to very stiff, moist, moderate to high plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1" in diameter, mode ~1/4"; common calcium carbonate stringer sand nodules throughout; stringers are subhorizontal and some are deformed; trace plant and tree roots; sharp, planar basal contact.

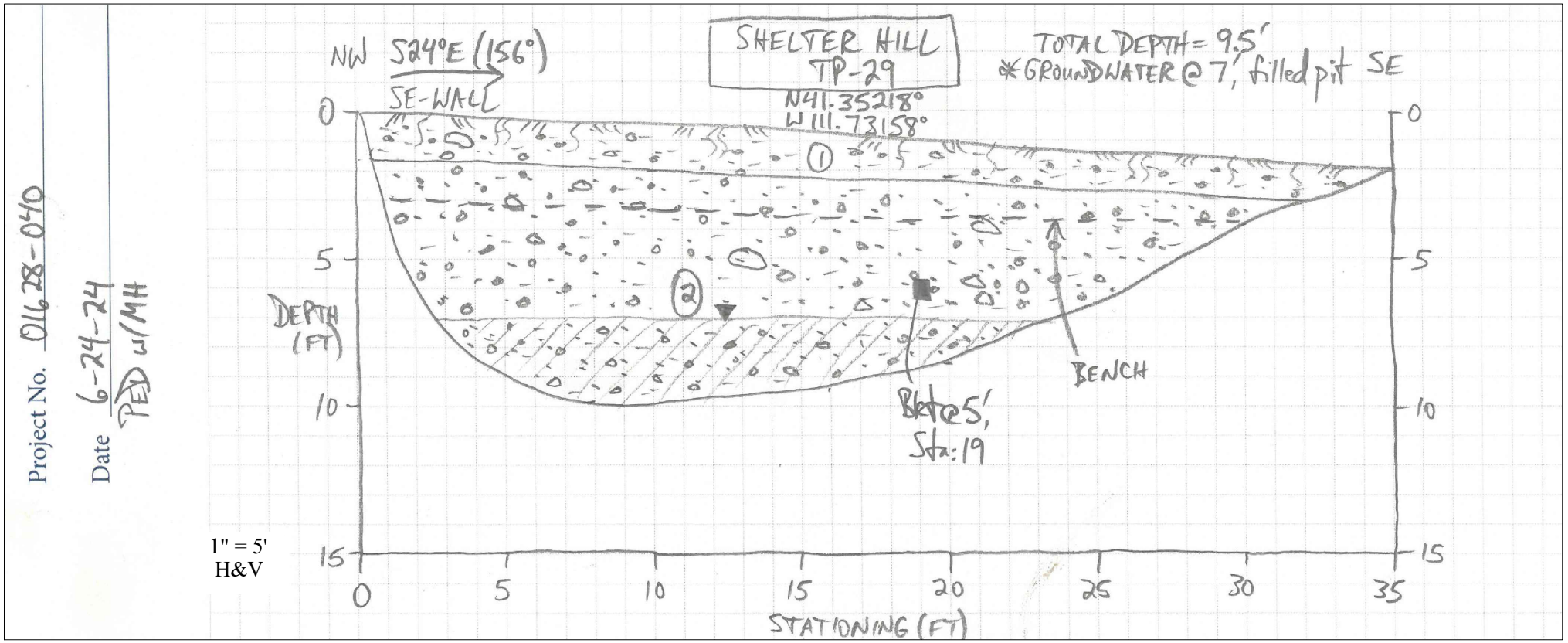
3) 3b. >2' thick; moderate reddish orange (10R 6/6) silty, clayey SAND (SM-SC) grading to sandy lean CLAY (CL), dense to medium dense, moist, low to moderate plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 1" in diameter, mode ~1/4"; common black organic inclusions and webbing; trace plant and tree roots.



Lithologic Unit Descriptions

1) **A/B Topsoil:** 1.5' thick; dark yellowish brown (10YR 4/2) sandy lean CLAY w/ gravel (CL), medium stiff to loose, moist, low plasticity, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1' in diameter, mode ~1-3"; abundant plant and tree roots; sharp, planar basal contact.

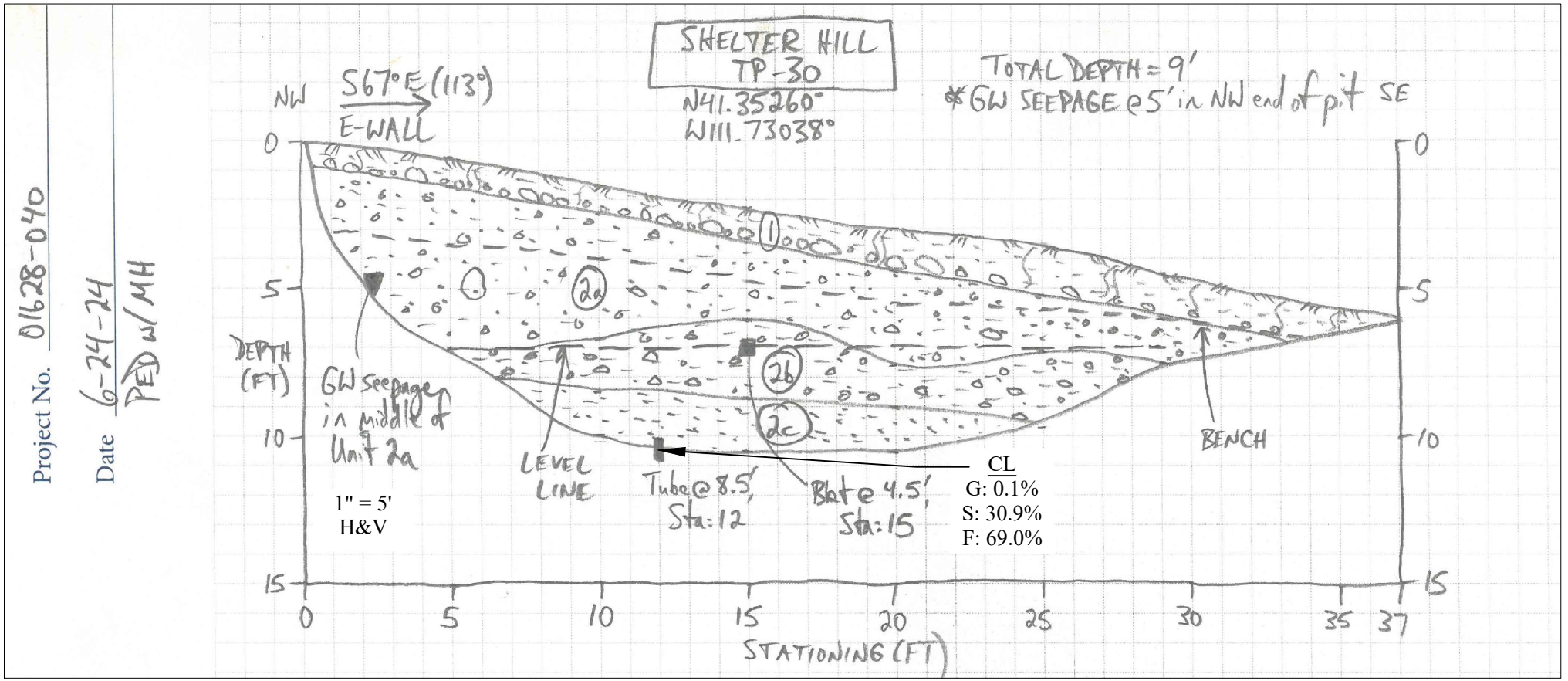
2) **Wasatch Formation (Tw):** >8' thick; dark reddish brown (10R 3/4) mottled with light gray (N7) in places clayey GRAVEL with sand (GC) grading to clayey SAND with gravel (SC), medium dense to dense, moist to wet, low plasticity fines, massive; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subangular to subrounded medium gray (N5) quartzite and dark gray (N3) dolomite up to 2' in diameter, mode ~3-5"; common cobbles in uppermost ~3' of unit and becomes more clast-rich with depth; sand component is medium-grained to coarse-grained; largely matrix-supported, but clast-supported in places; few plant and tree roots.



Lithologic Unit Descriptions

1) **A/B Topsoil:** ~1.25-1.5' thick; dark yellowish brown (10YR 4/2) sandy lean CLAY w/ gravel (CL), medium stiff to loose, moist, low plasticity, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1' in diameter, mode ~1-3"; abundant plant and tree roots; sharp, planar basal contact.

2) **Wasatch Formation (Tw):** >8' thick; dark reddish brown (10R 3/4) mottled with light gray (N7) in places clayey SAND with gravel (SC) grading to clayey GRAVEL with sand (GC), medium dense to dense, moist to wet, low plasticity fines, massive; gravel and larger sized clasts comprise ~30-50% of unit; clasts are subangular to subrounded medium gray (N5) quartzite and dark gray (N3) dolomite up to 2.5' in diameter, mode ~3-5"; sand component is fine-grained to medium-grained; largely matrix-supported, but clast-supported in places; few plant and tree roots.



Lithologic Unit Descriptions

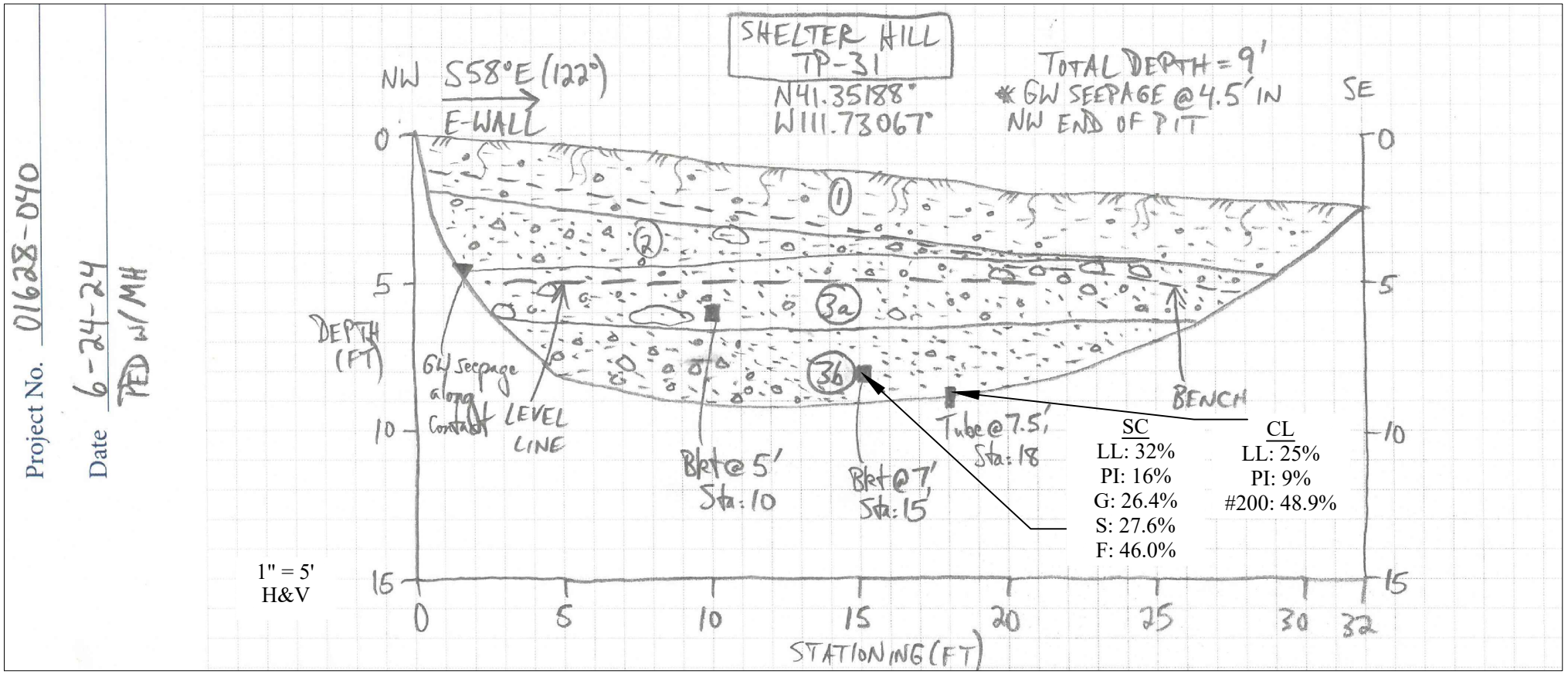
1) **A/B Topsoil/Colluvium (Qc):** Up to 1.75' thick; grayish brown (5Y 3/2) sandy lean CLAY with gravel (CL) grading to clayey GRAVEL with sand (GC), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~20-60% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 10" in diameter, mode ~3-4"; basal ~6-8" is cobbly stone line; abundant plant and tree roots; sharp, largely planar basal contact.

2) **Wasatch Formation (Tw):** >8' thick; highly weathered conglomerate bedrock; 3 subunits:

2a. Up to 6' thick; moderate reddish brown (10R 4/6) mottled with light gray (N7) clayey SAND with gravel (SC), dense, moist to wet, low plasticity fines, massive to thinly bedded; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, mode ~2-4"; uppermost ~3' of unit is not mottled; gradational to clayey GRAVEL with sand (GC) in places; few plant and tree roots; sharp, highly irregular basal contact.

2b. Up to 3' thick; dark reddish brown (10R ¾) clayey GRAVEL with sand (GC), dense, moist, low to moderate plasticity fines, massive; gravel and larger sized clasts comprise ~40% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 8" in diameter, mode ~3-5"; sand component is fine-grained to medium-grained; occasional plant and tree roots; sharp, planar basal contact.

2c. >2' thick; dark reddish brown (10R ¾) clayey SAND (SC) grading to clayey SAND with gravel (SC), dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~5-30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 7" in diameter, mode ~2-4"; unit is less weathered and some appears as relict silty sandstone bedrock; sand component is fine-grained; light gray (N7) to white (N9) calcium carbonate flour mottling in places; few small plant and tree roots.



Lithologic Unit Descriptions

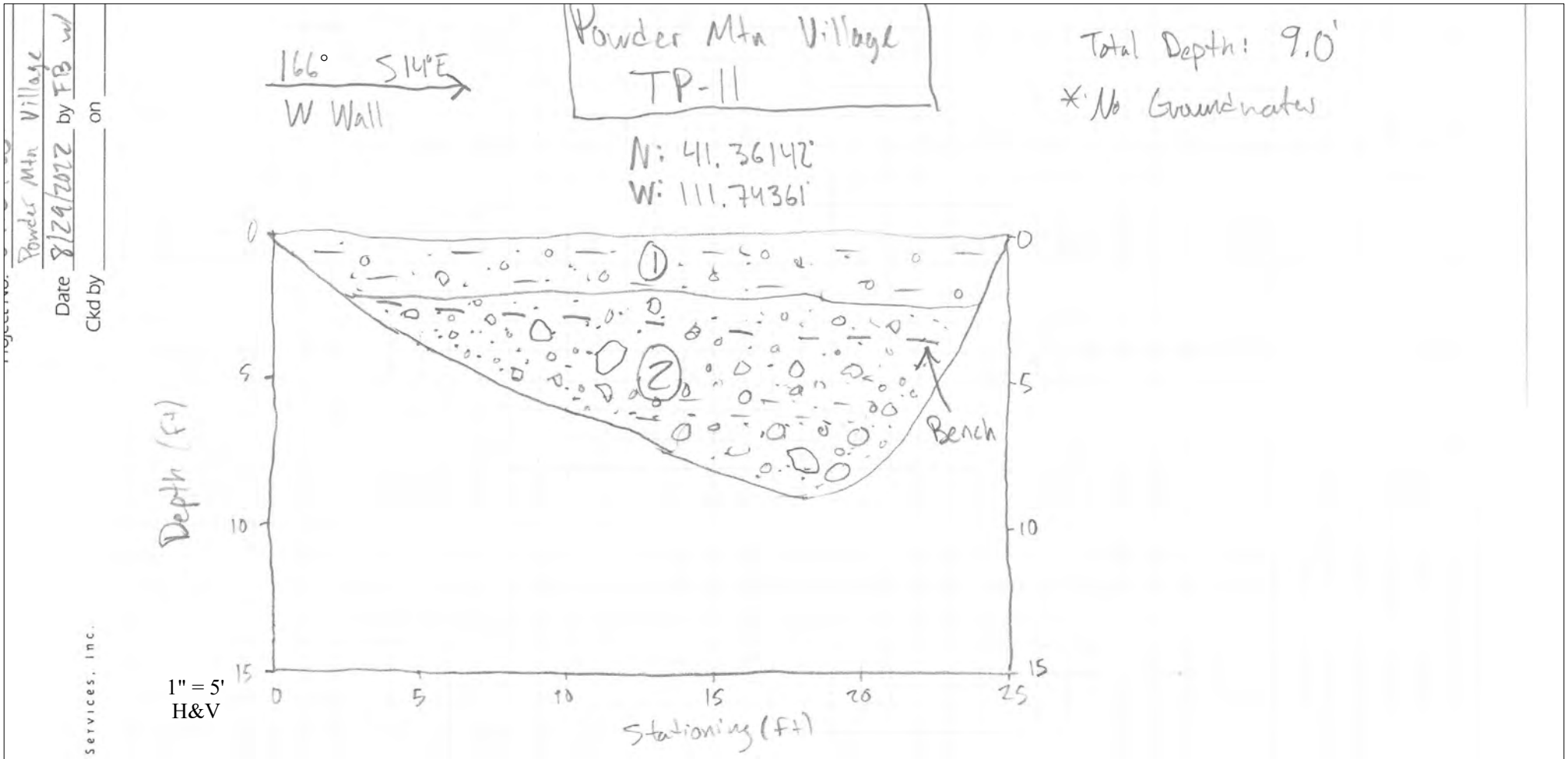
1) **A/B Topsoil:** ~2-2.5' thick; dark yellowish brown (10YR 4/2) sandy lean CLAY w/ gravel (CL), loose, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~20% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 4" in diameter, mode ~1-2"; abundant plant and tree roots; sharp, largely planar basal contact.

2) **Colluvium (Qc):** Up to 2.5' thick; moderate yellowish brown (10YR 5/4) to moderate reddish brown (10R 4/6) clayey SAND with gravel (SC), medium dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~20-25% of unit; clasts are subrounded to subangular quartzite up to 1' in diameter, mode ~2-4"; common plant and tree roots; sand component is fine-grained to medium-grained; unit pinches out to southeast; sharp, planar basal contact.

1) **Wasatch Formation (Tw):** >5' thick; highly weathered conglomerate bedrock; 2 subunits:

3a. Up to 2.5' thick; mottled moderate reddish orange (10R 6/6) and light gray (N7) clayey SAND with gravel (SC), dense, moist to wet, low plasticity fines, massive to thinly bedded; gravel and larger sized clasts comprise ~30-40% of unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, mode ~2-4"; mottled due to unit producing perched groundwater conditions; uppermost 1" of unit is light gray (N7) clayey sand lens; gradational to clayey GRAVEL with sand (GC) in places; few plant and tree roots; sharp, largely planar basal contact.

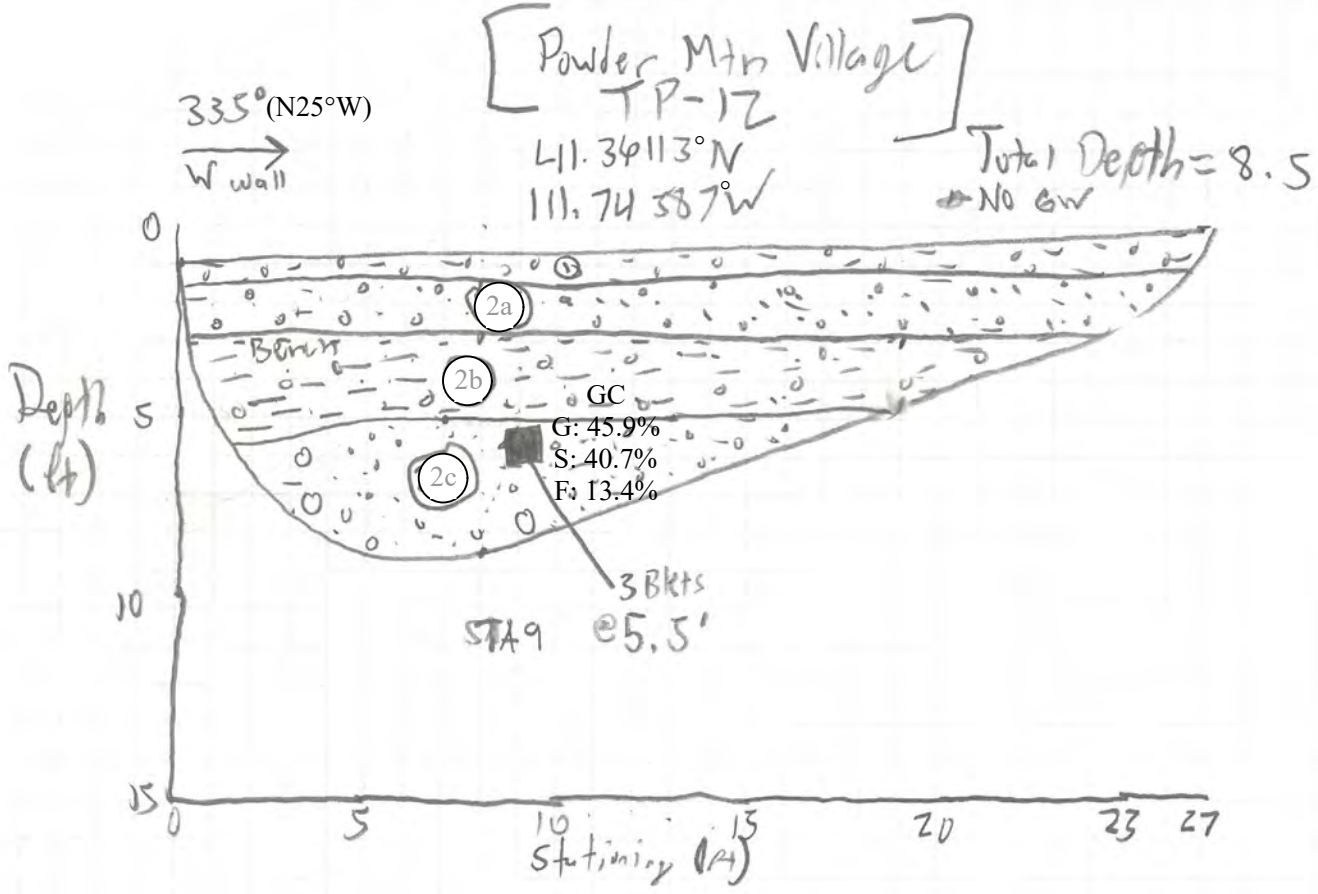
3b. >2.5' thick; dark reddish brown (10R ¾) clayey SAND (SC) grading to clayey SAND with gravel (SC), dense, moist, low plasticity fines, massive; gravel and larger sized clasts comprise ~5-30% of unit; clasts are subangular to subrounded medium gray (N5) quartzite up to 7" in diameter, mode ~2-4"; sand component is fine-grained; light gray (N7) to white (N9) calcium carbonate flour mottling in places; southeastern half of test pit is significantly more clast-poor than northwestern half; few small plant and tree roots.



LITHOLOGIC UNIT DESCRIPTIONS

1. **A/B Topsoil:** ~2.5' thick; dusky brown (5YR 2/2) silty lean CLAY with gravel (CL), medium stiff, moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of the unit; clasts are all subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, though the mode clast size is <1"; few plant and tree roots; sharp, planar basal contact.
2. **Weathered Wasatch Formation (Tw)**: >7' thick; dark yellowish orange (10YR 6/6) poorly graded GRAVEL with sand (GP), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clasts comprise ~50% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1.5' in diameter, though the mode clast size is 3-4"; few plant roots.

Project No. 04024-001
Date 8/29/12 by BDQ
Ckd by _____ on _____

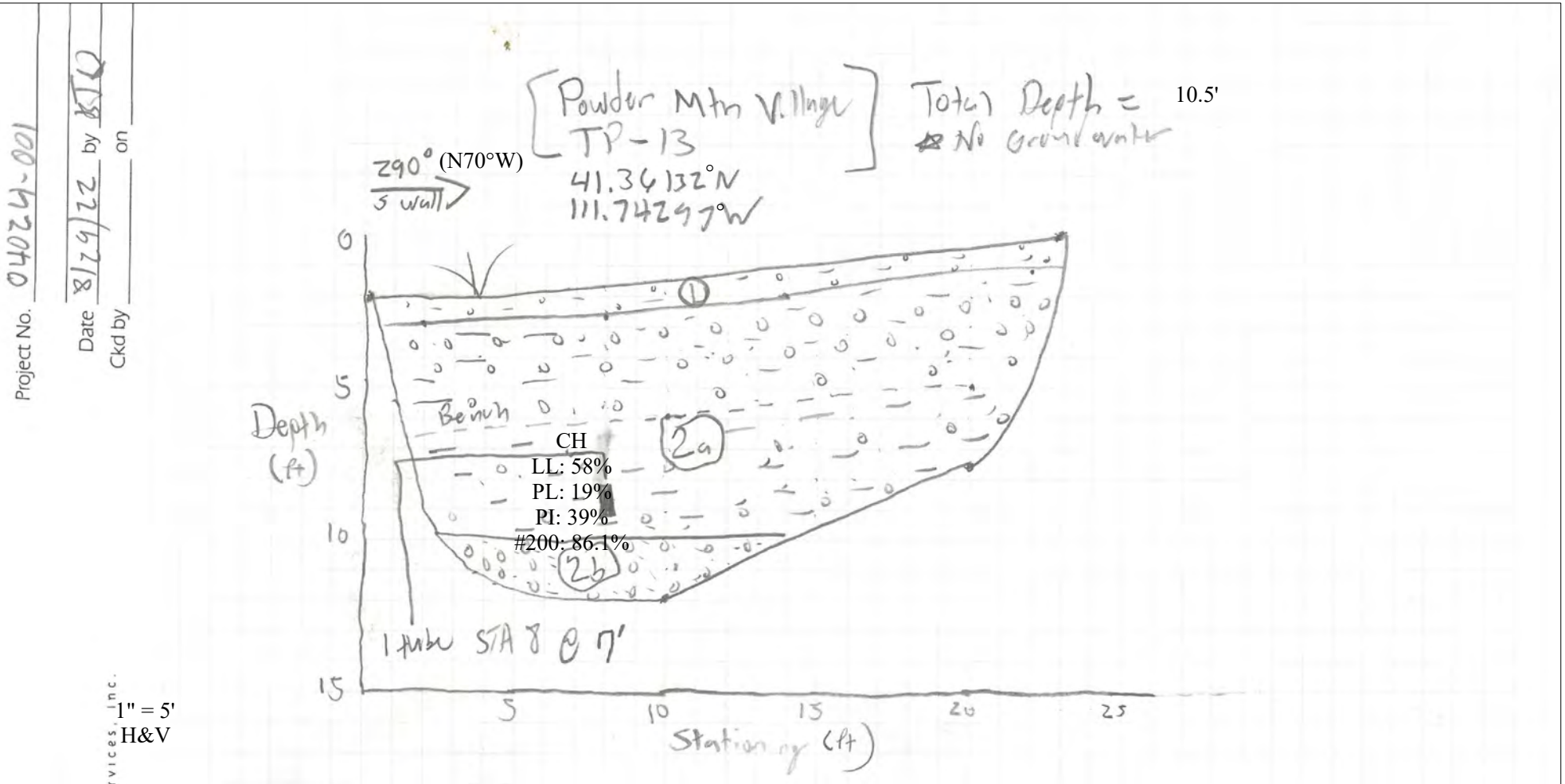


1" = 5'
H&V

LITHOLOGIC UNIT DESCRIPTIONS

1. **A/B Topsoil:** ~6" thick; dusky brown (5YR 2/2) silty lean CLAY with gravel (CL), medium stiff, moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of the unit; clasts are all subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, though the mode clast size is <1"; few plant and tree roots; sharp, planar basal contact.

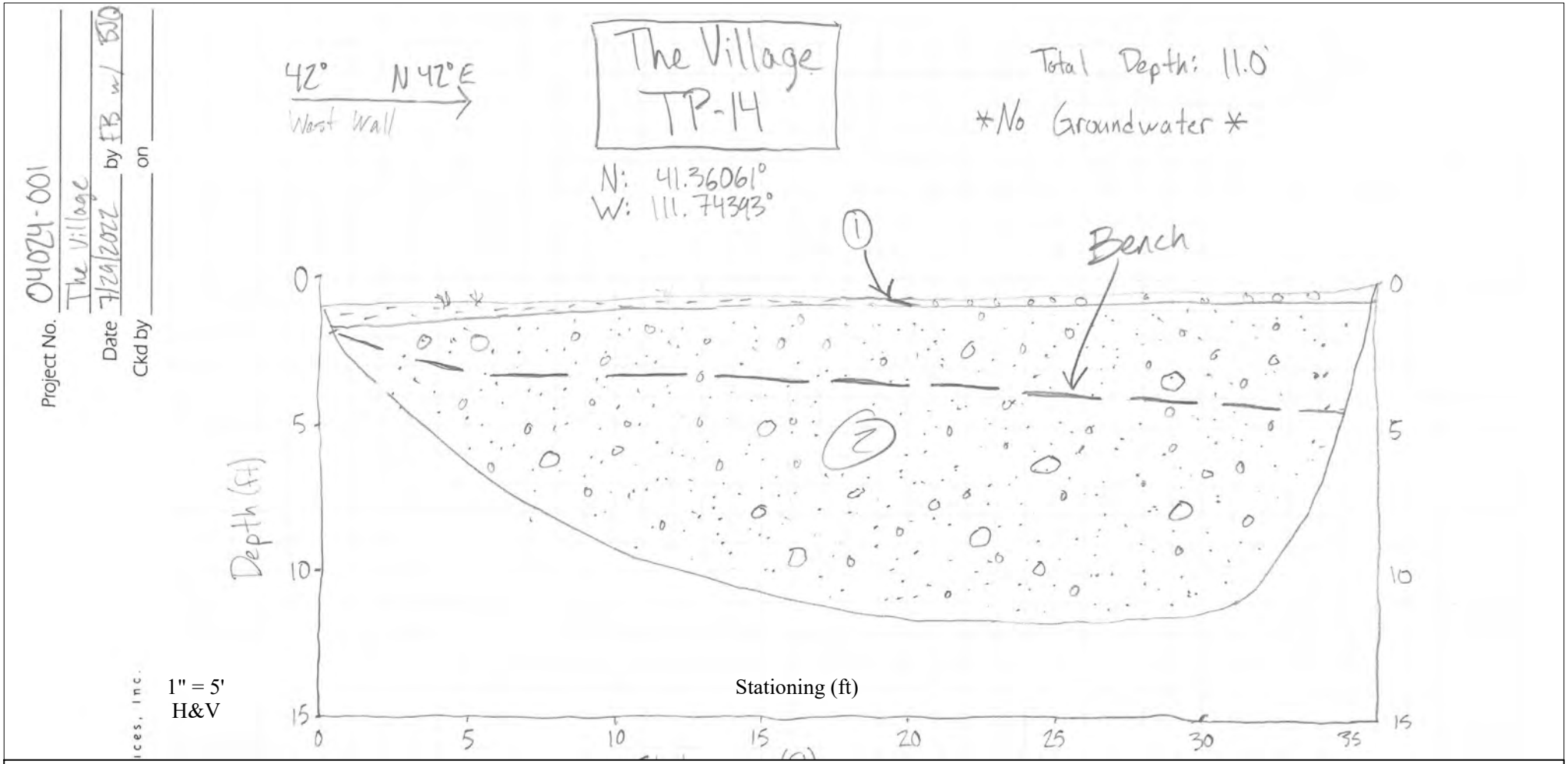
2. **Weathered Wasatch Formation (Tw)**:
   a. ~1.5' thick; grayish brown (5Y 3/2) clayey GRAVEL with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clast sizes comprise ~70% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6"in diameter, though the mode clast size is 2-4"; few plant roots.
   b. ~2-2.5' thick; moderate red (5R 5/4) sandy lean CLAY (CL), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger clast sizes comprise ~10% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6" in diameter, though the mode clast size is ~1-2"; blocky texture; common plant roots; sharp, irregular basal contact.
   c. >4' thick; grayish brown (5Y 3/2) clayey GRAVEL with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clast sizes comprise ~70% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6"in diameter, though the mode clast size is 2-4"; few plant roots.



LITHOLOGIC UNIT DESCRIPTIONS

1. **A/B Topsoil:** ~1' thick; dusky brown (5YR 2/2) silty lean CLAY with gravel (CL), medium stiff, moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of the unit; clasts are all subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, though the mode clast size is <1"; few plant and tree roots; sharp, planar basal contact.

2. **Weathered Wasatch Formation (Tw)**:
   a. ~7.5' thick; moderate red (5R 5/4) sandy lean CLAY with gravel (CL) gradational to a sandy fat CLAY (CH), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger clast sizes comprise ~25-30% of the unit; gravel content decreases with depth to 10%; clasts are subrounded to subangular medium gray (N5) quartzite up to 18" in diameter, though the mode clast size is 2"; blocky clay observed in top half of unit observed to become more plastic with depth; common plant roots; sharp, planar basal contact.
   b. >2' thick; grayish brown (5Y 3/2) clayey GRAVEL with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clast sizes comprise ~70% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 6"in diameter, though the mode clast size is 2-4"; few plant roots.



LITHOLOGIC UNIT DESCRIPTIONS

1. **Undocumented Fill (Afu):** 6” thick; pale brown (5YR 5/2) clayey GRAVEL with sand (GC) gradational to a grayish brown (5Y 3/2) sandy lean CLAY with gravel (CL), very dense, slightly moist, low plasticity fines, massive; gravel and larger clasts comprise ~20-40% of the unit; includes minor modern topsoil; few plant roots; sharp, irregular basal contact.

2. **Weathered Wasatch Formation (Tw):** >10.5' thick; moderate reddish brown (10R 4/6) mottled with dark yellowish orange (10YR 6/6) and light gray (N7) clayey SAND with gravel (SC), dense to very dense, moist, moderate plasticity fines, massive to medium sub-horizontal bedding; gravel and larger clasts comprise ~30-40% of the unit; clasts are all subrounded to subangular medium gray (N5) quartzite up to 1.5' in diameter, though the mode clast size is 2-3”; highly variable unit with abundant clay, sand and gravel lenses typically less than 6” thick; the unit is matrix supported; sand is fine to medium-grained; few to occasional plant and tree roots.

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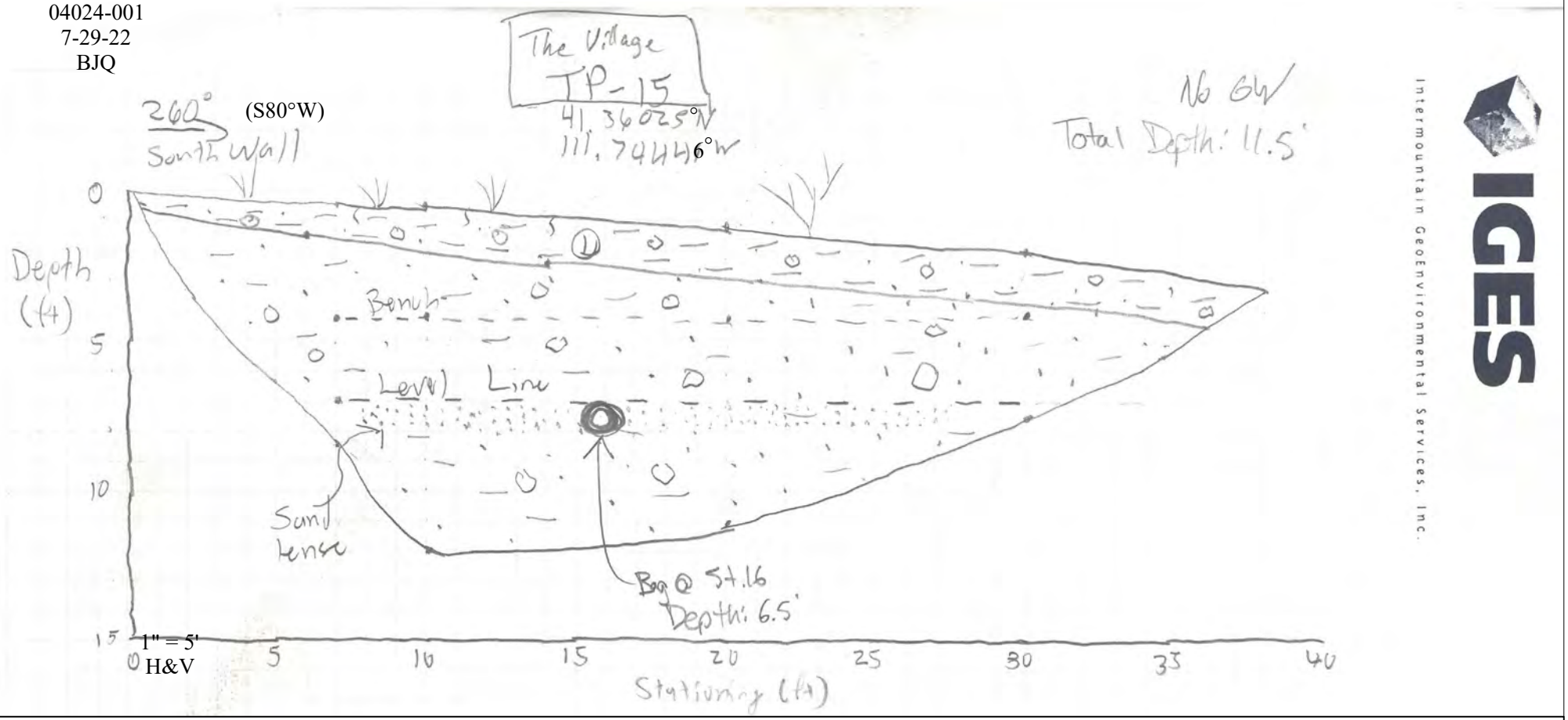
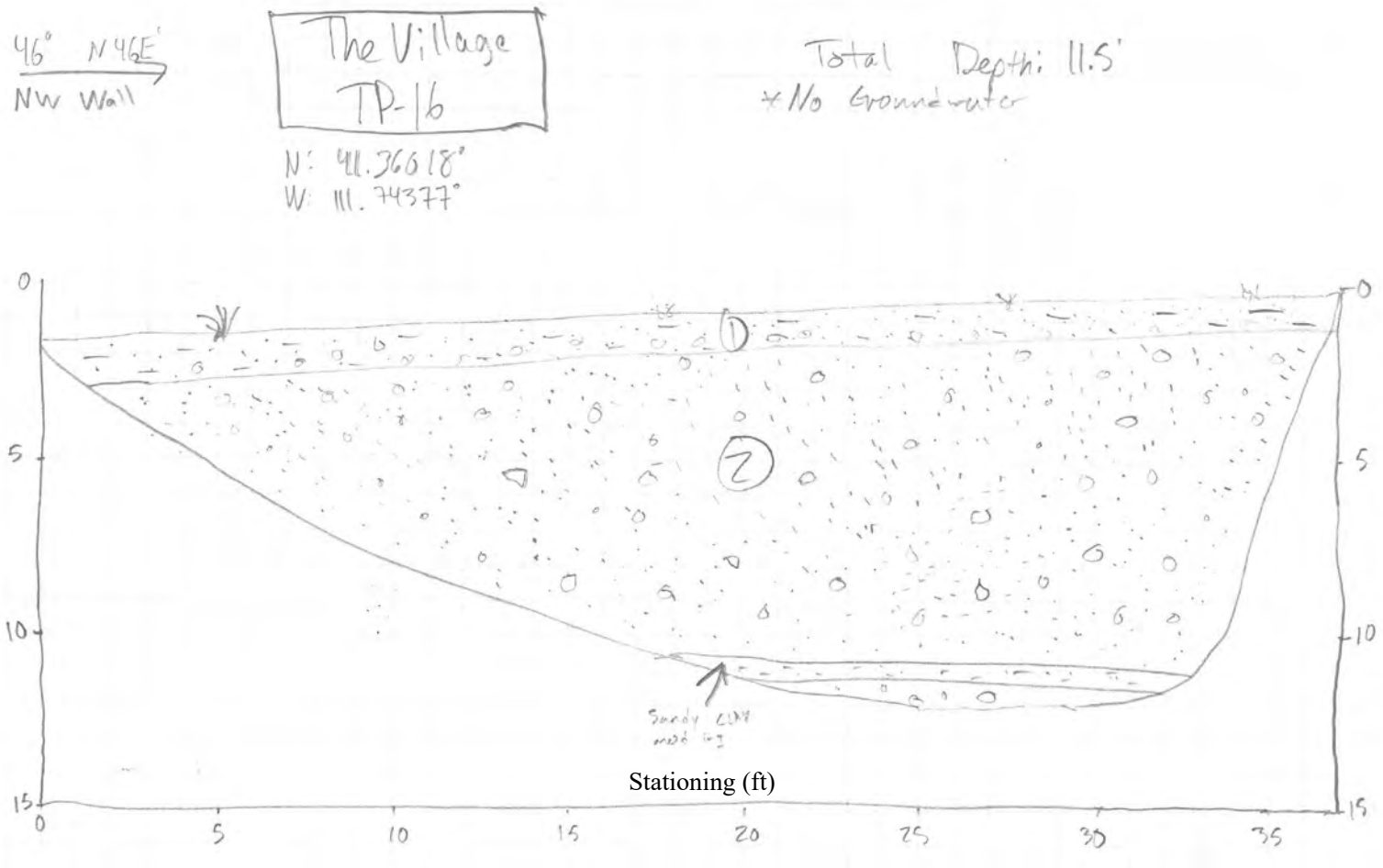
BJQ



LITHOLOGIC UNIT DESCRIPTIONS

1. **Colluvium (Qc):** 1-1.5' thick; light brown (5YR 6/4) sandy lean CLAY with gravel (CL), medium stiff, dry, low plasticity, massive; gravel and larger clasts comprise ~15-25% of the unit; clasts are subrounded medium gray (N5) quartzite up to 6" in diameter, though the mode clast size is 2-3"; includes a 1-2" thick modern A-Horizon topsoil at top of unit; plant roots common; gradational, irregular basal contact.
2. **Weathered Wasatch Formation (Tw):** >10' thick; moderate reddish brown (10R 4/6) mottled with dark yellowish orange (10YR 6/6) and light gray (N7) clayey SAND with gravel (SC), dense to very dense, moist to wet, moderate to high plasticity fines, massive to medium sub-horizontal bedding; gravel and larger clasts comprise ~30% of the unit; clasts are all subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, though the mode clast size is 2-4"; highly variable unit with abundant clay, sand and gravel lenses typically less than 6" thick; the unit is matrix supported; sand is medium to coarse-grained; few to occasional plant and tree roots.

Project No. 04024-001
The Village
Date 7/29/2022 by EB w/ BJG
Ckd by ____ on ____



1" = 5'
H&V

LITHOLOGIC UNIT DESCRIPTIONS

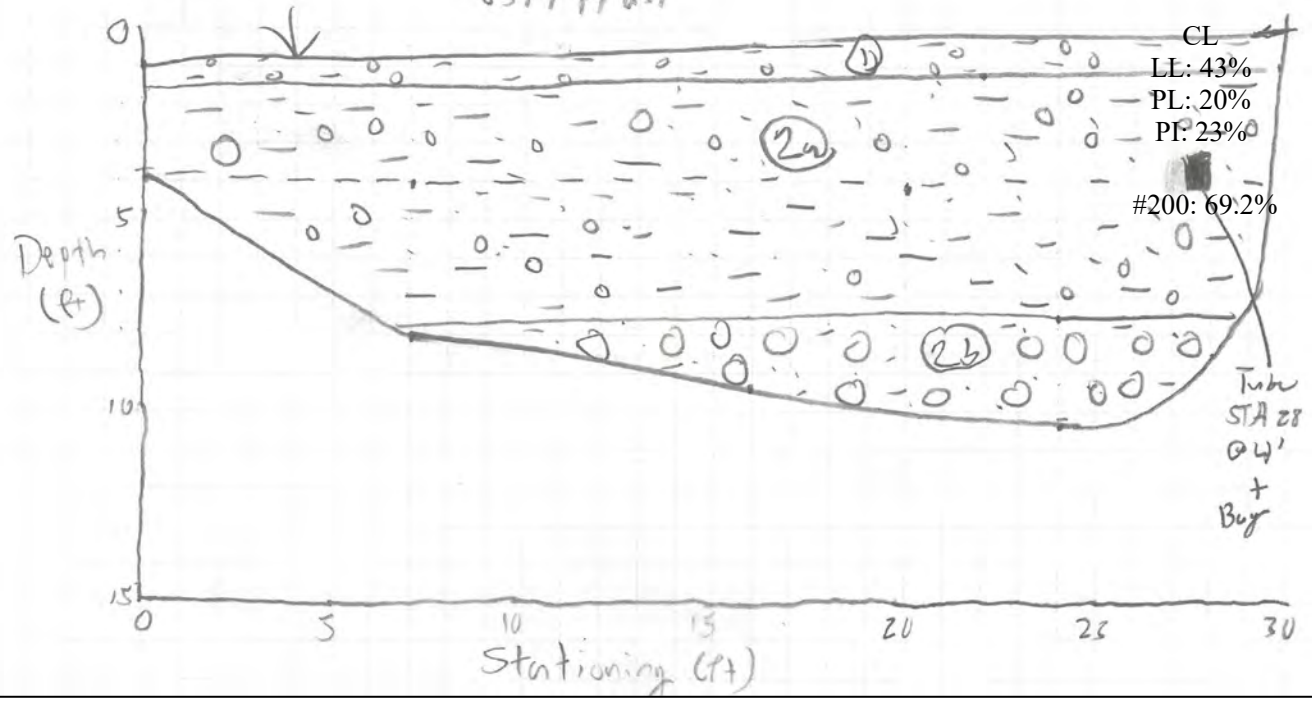
1. **A/B Topsoil:** 1-1.5' thick; dusky brown (5YR 2/2) to moderate yellowish brown (10YR 5/4) sandy lean CLAY with gravel (CL), medium stiff, slightly moist, low plasticity fines, massive; gravel and larger clasts comprise ~20% of the unit; clasts are all subrounded to subangular medium gray (N5) quartzite up to 6" in diameter, though the mode clast size is ~1"; few plant roots; sharp, planar basal contact.
2. **Weathered Wasatch Formation (Tw):** >10.5' thick; moderate reddish brown (10R 4/6) mottled with dark yellowish orange (10YR 6/6) and light gray (N7) clayey SAND with gravel (SC), dense to very dense, moist, moderate plasticity fines, massive to medium sub-horizontal bedding; gravel and larger clasts comprise ~30-40% of the unit; clasts are all subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, though the mode clast size is 3-4"; highly variable unit with abundant clay, sand and gravel lenses typically less than 6" thick; the unit is matrix supported; sand is fine to medium-grained; few to occasional plant and tree roots.

Project No. 04024-001 Powder Mtn Village
Date 8/29/22 by RSD
Ckd by ____ on ____

[Powder Mtn Village TP-17] Total Depth = 11.5'
*No GW

255° (S75°W)
5 wall

41.360479°N
111.742881°W
8581 ft msl

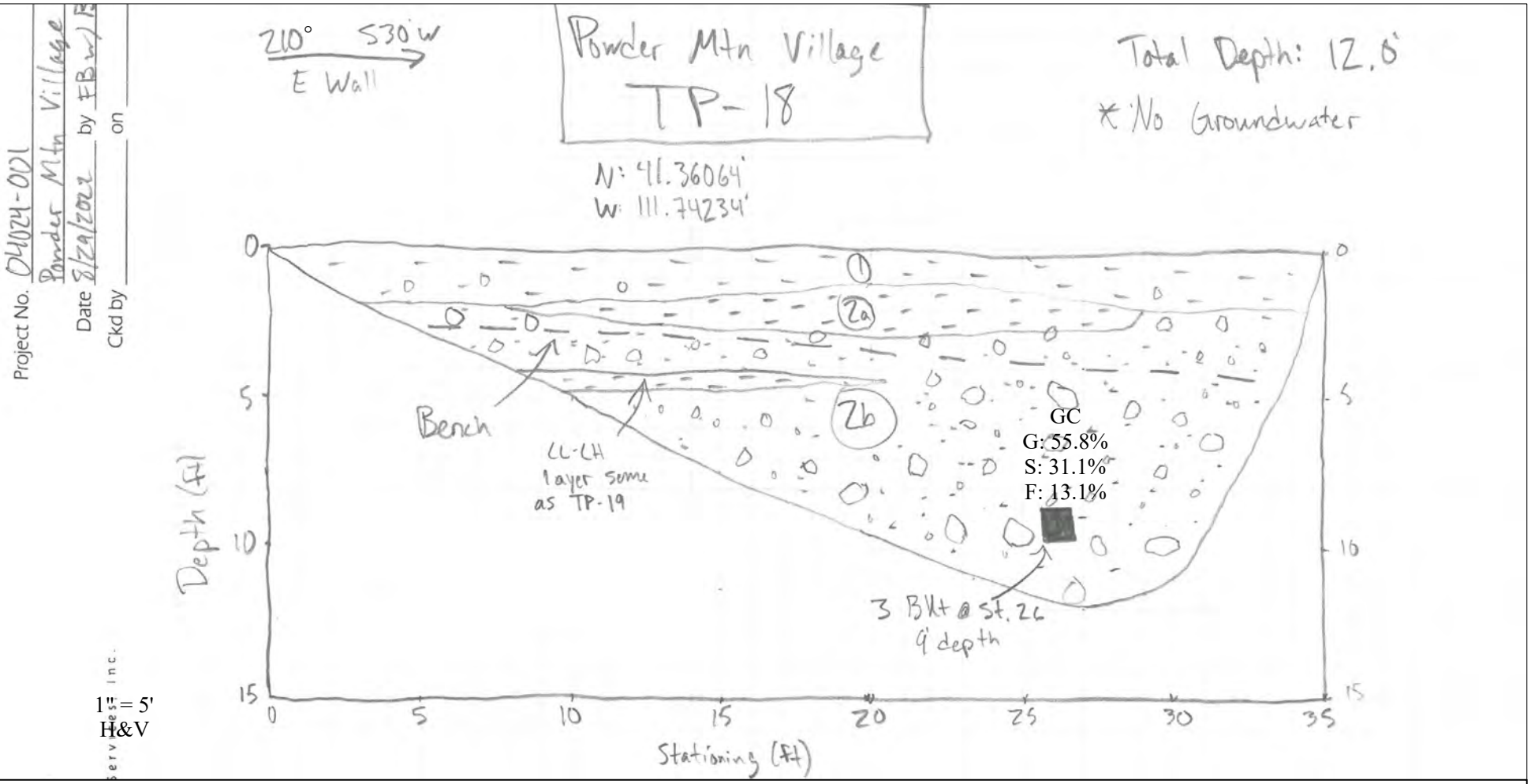


1" = 5'
H&V

LITHOLOGIC UNIT DESCRIPTIONS

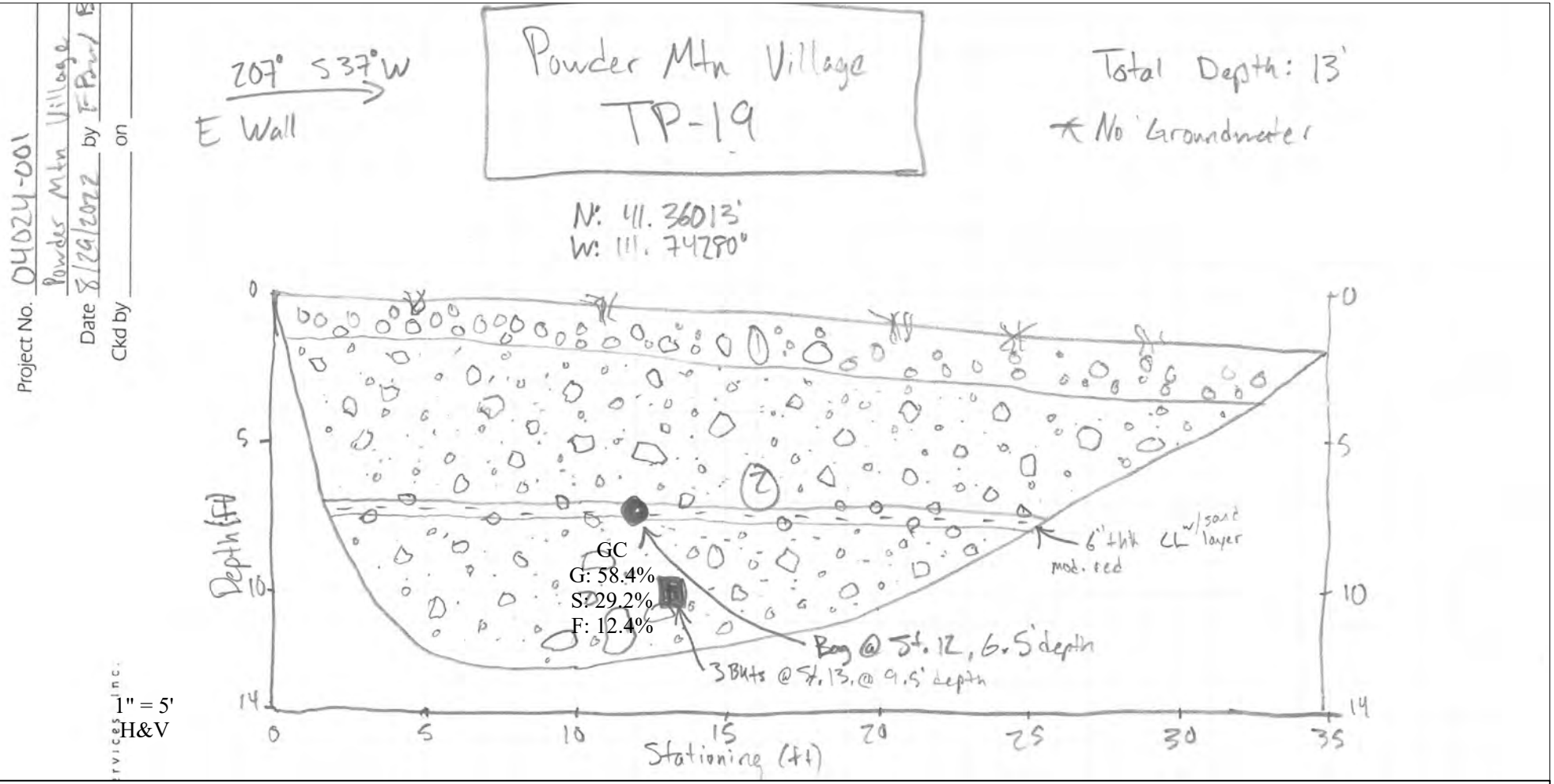
1. **A/B Topsoil:** ~1' thick; dusky brown (5YR 2/2) silty lean CLAY with gravel (CL), medium stiff, moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of the unit; clasts are all subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, though the mode clast size is <1"; few plant and tree roots; sharp, planar basal contact.

2. **Weathered Wasatch Formation (Tw):**
   a. Up to 5.5' thick; moderate red (5R 5/4) sandy lean CLAY with gravel (CL), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger clast sizes comprise ~25-30% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 8" in diameter, though the mode clast size is 2"; common plant roots; gradational, planar basal contact.
   b. >3' thick; dark yellowish orange (10YR 6/6) clayey GRAVEL with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clast sizes comprise ~70% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, though the mode clast size is 4-5"; few plant roots.



LITHOLOGIC UNIT DESCRIPTIONS

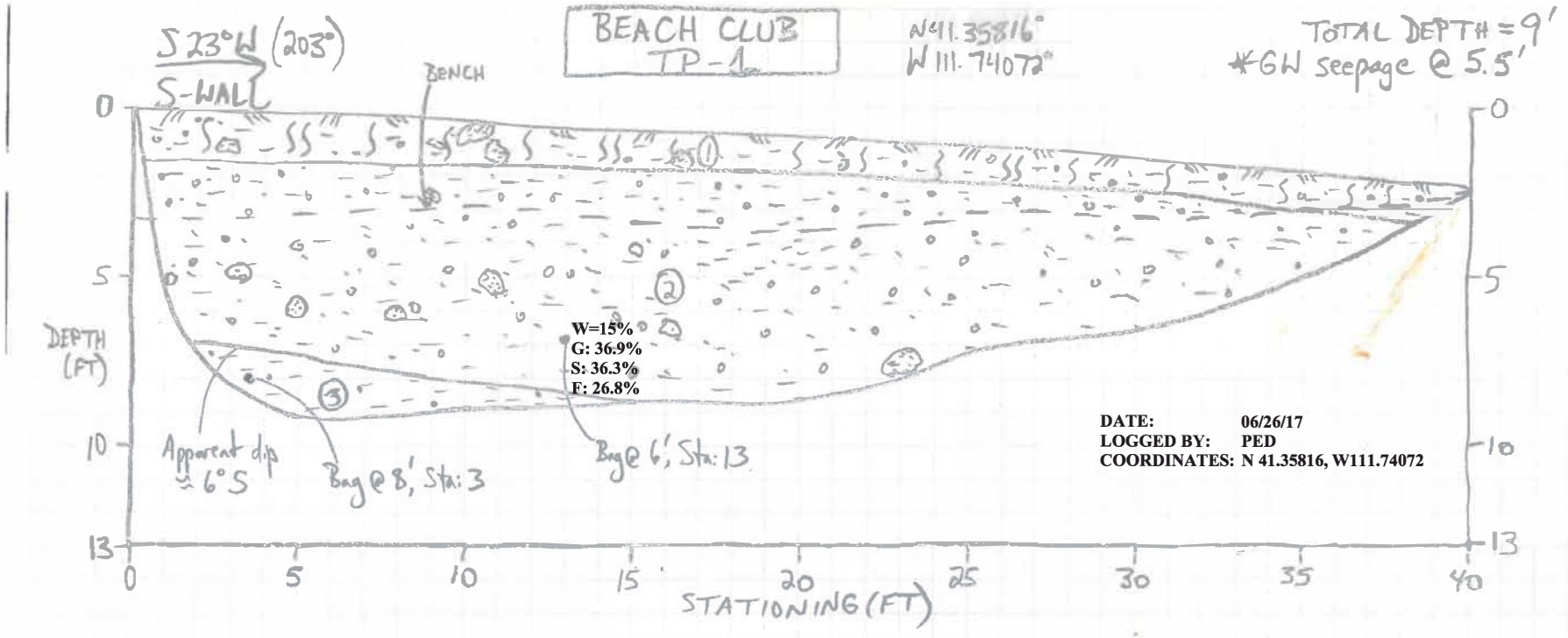
1. **A/B Topsoil:** ~1' thick; dusky brown (5YR 2/2) silty lean CLAY with gravel (CL), medium stiff, moist, low plasticity, massive; gravel and larger sized clasts comprise ~30% of the unit; clasts are all subangular to subrounded medium gray (N5) quartzite up to 4" in diameter, though the mode clast size is <1"; few plant and tree roots; sharp, planar basal contact.
2. **Weathered Wasatch Formation (Tw):**
   a. Up to 1.5' thick; moderate red (5R 5/4) sandy lean CLAY with gravel (CL), medium stiff to stiff, slightly moist, moderate plasticity, massive to weakly bedded; gravel and larger clast sizes comprise ~25-30% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 8" in diameter, though the mode clast size is 2"; common plant roots; gradational, planar basal contact.
   b. >9' thick; dark yellowish orange (10YR 6/6) clayey GRAVEL with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clast sizes comprise ~65% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 1.5' in diameter, though the mode clast size is 4-5"; few plant roots.



LITHOLOGIC UNIT DESCRIPTIONS

1. **Undocumented Fill (Afu):** ~2' thick; pale yellowish brown (10YR 6/2) clayey GRAVEL with sand (GC), medium dense, slightly moist, low plasticity fines, massive; gravel and larger clasts comprise ~50-60% of the unit; clasts are all subrounded to subangular medium gray (N5) quartzite up to 1' in diameter, though the mode clast size is 2-3", common tree and plant roots; sharp, irregular basal contact.

2. **Weathered Wasatch Formation (Tw):** >11' thick; moderate reddish brown (10R 4/6) to dark yellowish orange (10YR 6/6) clayey GRAVE with sand (GC), medium dense to dense, moist to slightly moist, low plasticity fines, weakly bedded; gravel and larger clasts comprise ~70% of the unit; clasts are subrounded to subangular medium gray (N5) quartzite up to 2' in diameter, though the mode clast size is 4-5"; weathers to a sand in places; few plant roots.



LITHOLOGIC UNIT DESCRIPTIONS:

1) A/B Soil Horizon: ~1.5' thick; grayish brown (5Y 3/2) sandy lean CLAY with gravel (CL), loose to medium stiff, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~10-15% of unit; clasts entirely subrounded medium gray (N5) to pale yellowish orange (10YR 8/6) quartzite up to 14" in diameter, though mode size <1"; abundant plant and tree roots; sharp, planar basal contact.

2) Wasatch Formation: ~6-7' thick; conglomerate bedrock nearly entirely disaggregated to dark reddish brown (10R 3/4) to moderate reddish brown (10R 4/6) clayey SAND with gravel (SC) and clayey GRAVEL with sand (GC) gradational to sandy fat CLAY with gravel (CH), medium dense, moist to wet, moderate to high plasticity fines, massive; gravel and larger sized clasts comprise ~20-30% of unit; clasts entirely subrounded quartzite as above up to 20" in diameter, though mode size ~1-2"; common 1 mm pinholes where clayey; some shear surfaces observed, but small and discontinuous (<1/2 cm); becomes sandier with depth; unit commonly sloughed into bottom of test pit; occasional to few small plant and tree roots; sharp, planar basal contact.

3) Clay Seam: >2' thick; dark reddish brown (10R ¾) fat CLAY (CH), stiff, wet, high plasticity, massive; gravel and larger sized clasts comprise <5% of unit; clasts entirely subrounded quartzite as above up to 1 cm in diameter; very homogeneous unit; groundwater seeping into unit from upper contact with Unit 2; too wet to see if slickensides present; dips downslope to the southwest.

SCALE: 1"=5' H&V

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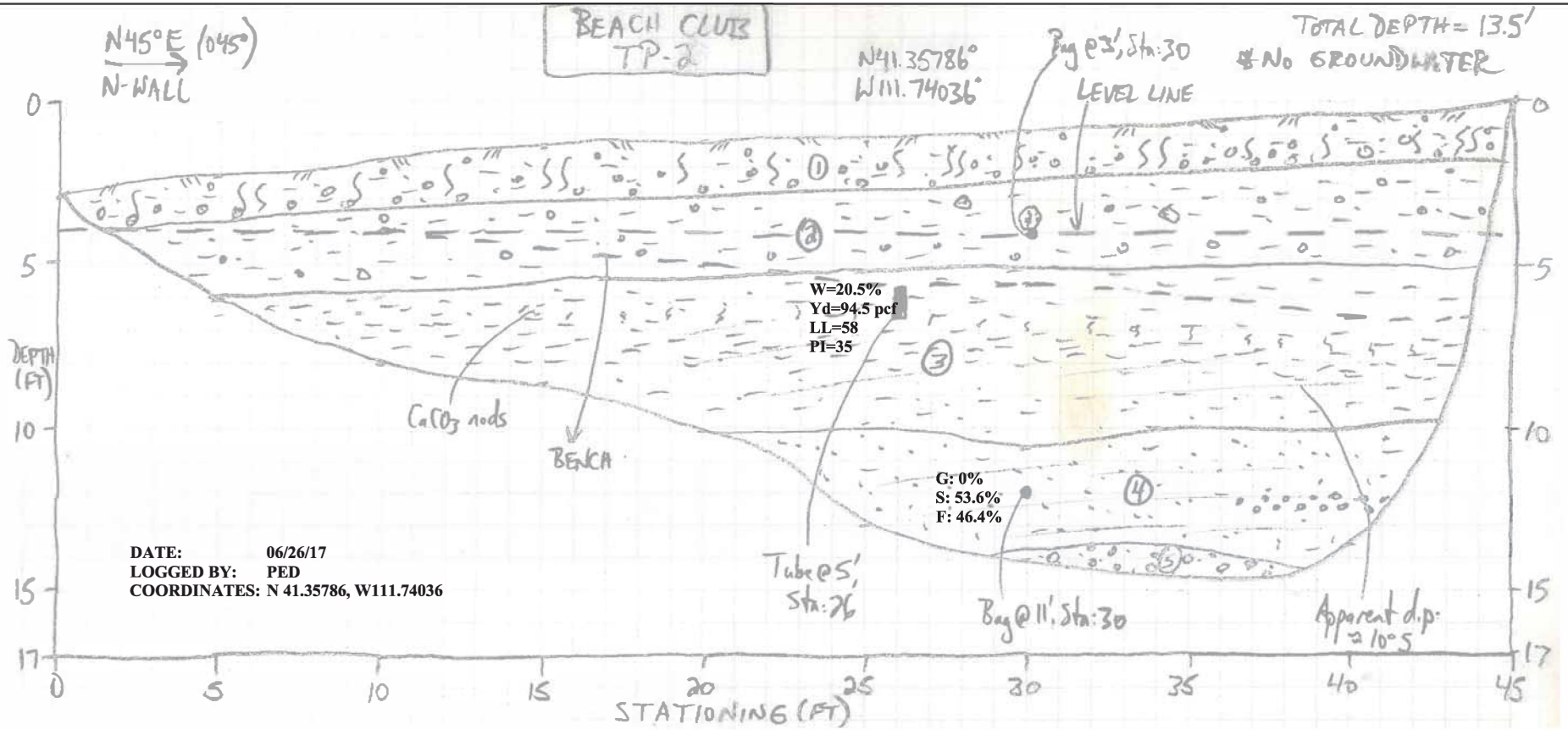
Summit Powder Mountain Resort
Weber County, Utah

TEST PIT LOG TP-1

Figure

A-47



LITHOLOGIC UNIT DESCRIPTIONS:

1) A/B Soil Horizon: ~1.5' thick; medium gray (N5) sandy lean CLAY with gravel (CL), stiff, dry, low plasticity, massive; gravel and larger sized clasts comprise ~20-25% of unit; clasts entirely subrounded to subangular medium gray quartzite up to 8" in diameter, though mode size ~3-4"; basal ~1' possibly colluvium with a topsoil matrix, as it is highly cobbly; abundant pore space and pinholes, and appears like cemented colluvium seen elsewhere on Powder Mountain; abundant plant and tree roots in uppermost ~3"; sharp, irregular basal contact.

2) Colluvium?: ~3' thick; mottled dark reddish brown (10R ¾) and dark yellowish orange (10YR 6/6) sandy fat CLAY with gravel (CH), stiff, moist, high plasticity, massive; gravel and larger sized clasts comprise ~15% of unit; clasts predominantly medium gray (N5) quartzite as above, though few medium dark gray (N4) sandy dolomite bedrock clasts; clasts up to 14" in diameter, though mode size ~4-6"; highly heterogeneous unit and grades sandy and gravelly in places; occasional small slickensides observed where clayey; possibly represents old landslide deposit; sharp, irregular basal contact.

3) Clay Seam: ~5-6' thick; moderate reddish brown (10R 4/6) to dark reddish brown (10R ¾) sandy fat CLAY (CH), stiff, moist, moderate to high plasticity, faintly medium bedded; gravel and larger sized clasts comprise <5% of unit; clasts entirely weathered dark yellowish orange (10YR 6/6) sandy dolomite bedrock, angular, up to 1 cm in diameter; uppermost ~2' of unit is fat clay with high plasticity with occasional slickensides; middle ~1' is mottled with white (N9) calcium carbonate nodules and stringers up to 2" in diameter; basal ~2' is sandy and increases in sand component with depth; common 1 mm pinholes; sharp, irregular basal contact.

4) Alluvial Sand: ~3-4' thick; moderate reddish brown (10R 4/6) to dark reddish brown (10R ¾) poorly graded clayey SAND (SC), medium dense, moist, faintly thinly bedded; medium to coarse-grained sand; no gravel and larger sized clasts observed, though a small gravel lens containing subrounded quartzite and sandy dolomite clasts was observed within the unit on the northeastern wall of the test pit; sharp, planar basal contact.

5) Alluvial Gravel: >1' thick; mottled dark reddish brown (10R ¾) and medium light gray (N6) poorly graded sandy GRAVEL (GP) gradational to gravelly SAND (SP), medium dense, moist, low plasticity fines, possibly finely bedded; gravel and larger sized clasts comprise ~30% of unit; clasts consist of a mix of angular sandy dolomite and subrounded quartzite up to 5" in diameter, though mode size ~1"; more sandy dolomite clasts present than quartzite clasts; sand is medium-grained to coarse-grained; larger angular sandy dolomite bedrock clasts excavated from base of test pit, likely corresponding to the top of bedrock.

SCALE: 1"=5' H&V

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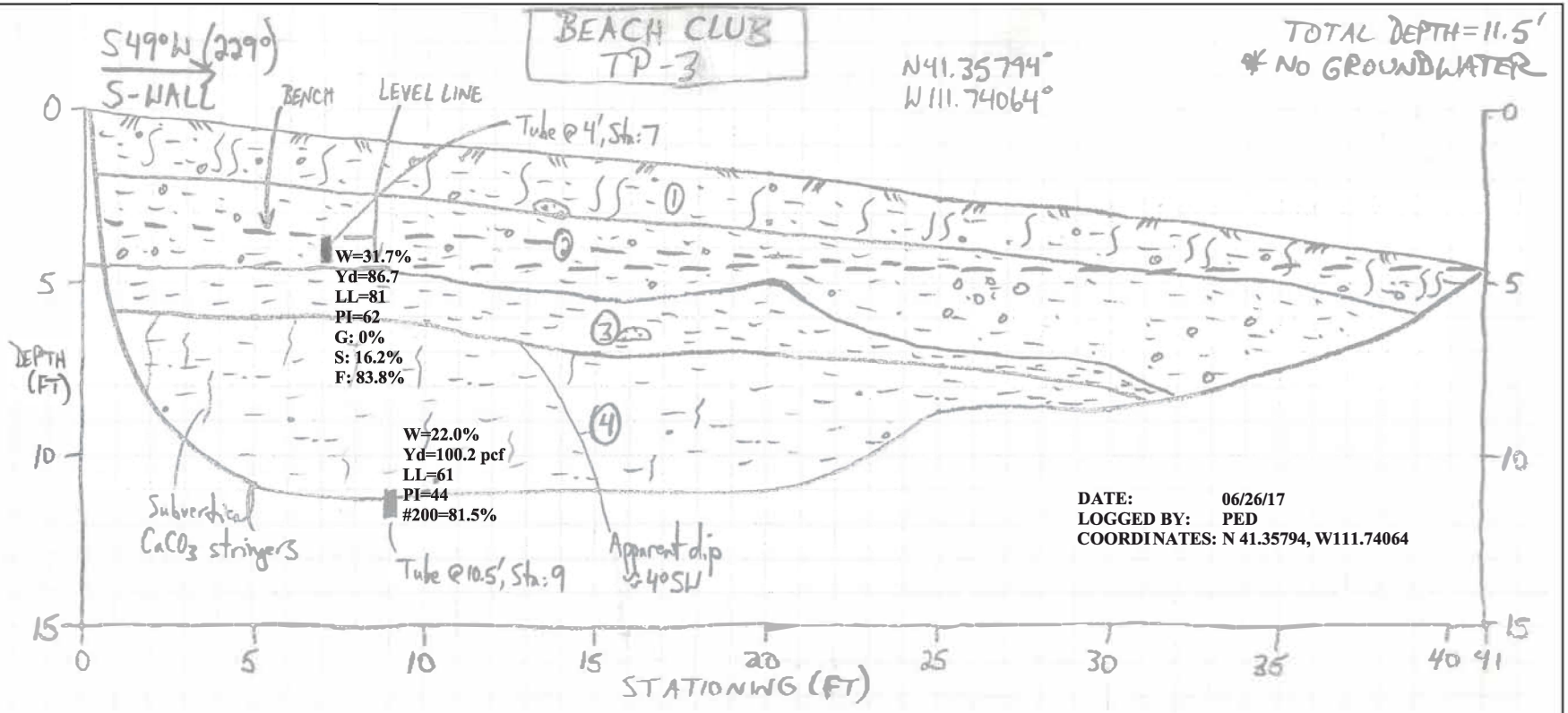
TEST PIT LOG TP-2

Figure

A-48



LITHOLOGIC UNIT DESCRIPTIONS:

1) **A/B Soil Horizon:** ~1.5-2' thick; grayish brown (5Y 3/2) to brownish black (5YR 2/1) sandy lean CLAY with gravel (CL), medium stiff to loose, slightly moist, low plasticity, massive; gravel and larger sized clasts comprise ~10-15% of unit; clasts entirely subrounded to subangular medium gray (N5) quartzite up to 1' in diameter, though mode size ~1-2"; abundant plant and tree roots; sharp, planar basal contact.

2) **Colluvium?:** ~2-3' thick; mottled to dark reddish brown (10R 3/4) and dark yellowish orange (10YR 6/6) sandy fat CLAY with gravel (CH), stiff, moist, moderate to high plasticity, massive; gravel and larger sized clasts comprise ~5-10% of unit; clasts are predominantly subangular to subrounded medium gray (N5) quartzite, though minor dark gray (N3) to dark yellowish orange sandy dolomite clasts; clasts are up to 6" in diameter, though mode size ~2"; slickensides common where predominantly clayey; possibly represents old landslide deposit; sharp, wavy basal contact.

3) **Clay Seam:** ~1.5-2' thick; pale olive (10Y 6/2) to dark yellowish brown (10YR 4/2) to dark reddish brown (10R ¾) fat CLAY with sand (CH), stiff to very stiff, moist, high plasticity, massive; rare gravel and larger sized clasts (<3%); clasts are entirely rounded quartzite up to 7" in diameter; highly glossy sheen and commonly slickensided, though in various orientations and not commonly downslope; possibly represents slide plane for Unit 2; thins notably downslope; abundant white (N9) calcium carbonate flour and fracture infilling throughout unit; sharp, wavy basal contact.

4) **Weathered Bedrock?:** >5' thick; dark reddish brown (10R ¾) to moderate reddish brown (10R 4/6) sandy fat CLAY (CH), stiff, moist, moderate to high plasticity, massive; rare (<5%) gravel and larger sized clasts, all subrounded quartzite?; common subvertical calcium carbonate stringers, some subhorizontal along what appear to be relict bedding planes; aside from stringers, unit is very homogeneous and appears like weathered Nounan Dolomite bedrock.

SCALE: 1"=5' H&V

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TEST PIT LOG TP-3

Figure

A-49

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			USCS SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (More than half of material is larger than the #200 sieve)	GRAVELS (More than half of coarse fraction is larger than the #4 sieve)	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS (More than half of coarse fraction is smaller than the #4 sieve)	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, SAND-GRAVEL-SILT MIXTURES
			SC	CLAYEY SANDS SAND-GRAVEL-CLAY MIXTURES
FINE GRAINED SOILS (More than half of material is smaller than the #200 sieve)	SILTS AND CLAYS (Liquid limit less than 50)		ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS (Liquid limit greater than 50)		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

LOG KEY SYMBOLS

BORING SAMPLE LOCATION

TEST-PIT SAMPLE LOCATION

WATER LEVEL (level after completion)

WATER LEVEL (level where first encountered)

CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBURG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

GENERAL NOTES

1. Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
2. No warranty is provided as to the continuity of soil conditions between individual sample locations.
3. Logs represent general soil conditions observed at the point of exploration on the date indicated.
4. In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA. SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE UNTRAINED SHEAR STRENGTH (tsf)	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

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KEY TO SOIL SYMBOLS AND TERMINOLOGY

Project Number - 01628-040

Figure A- 50

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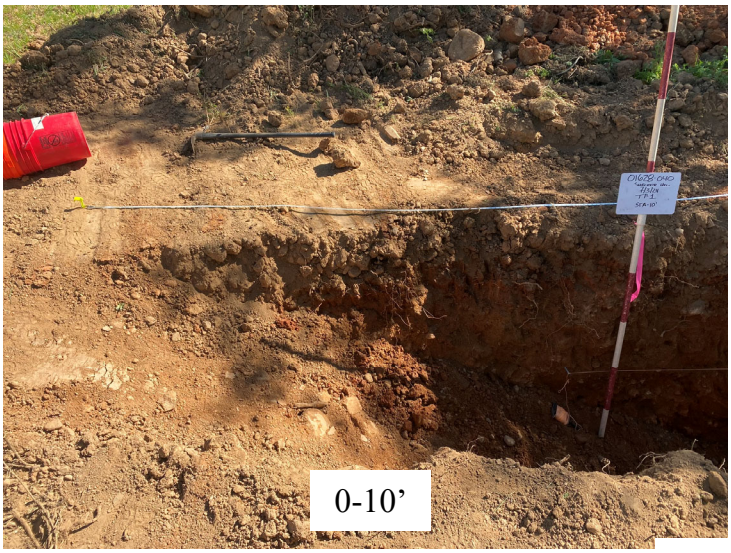
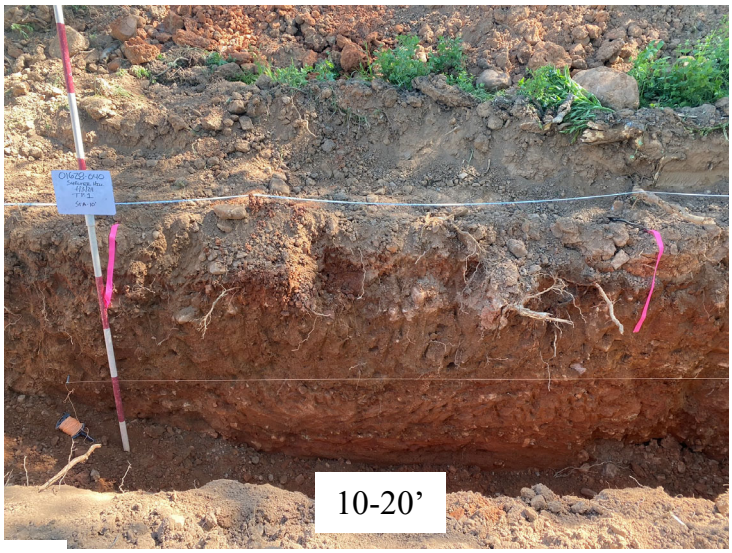
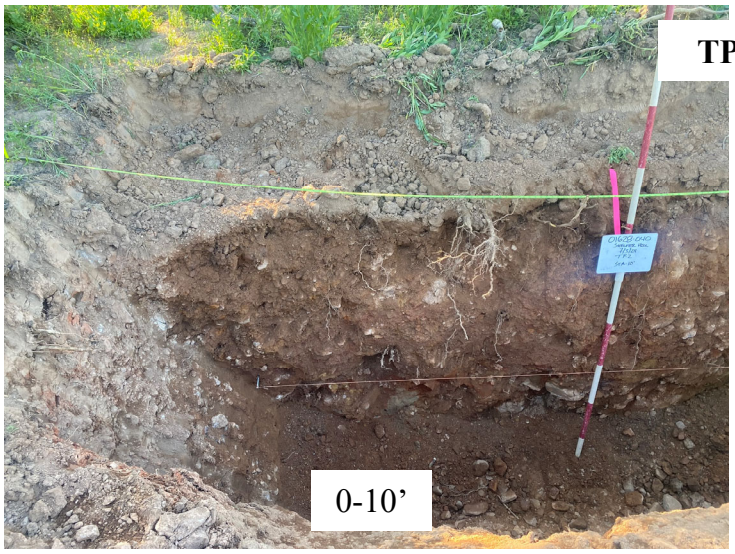




TP-1



TP-2

Photos taken on July 3, 2024

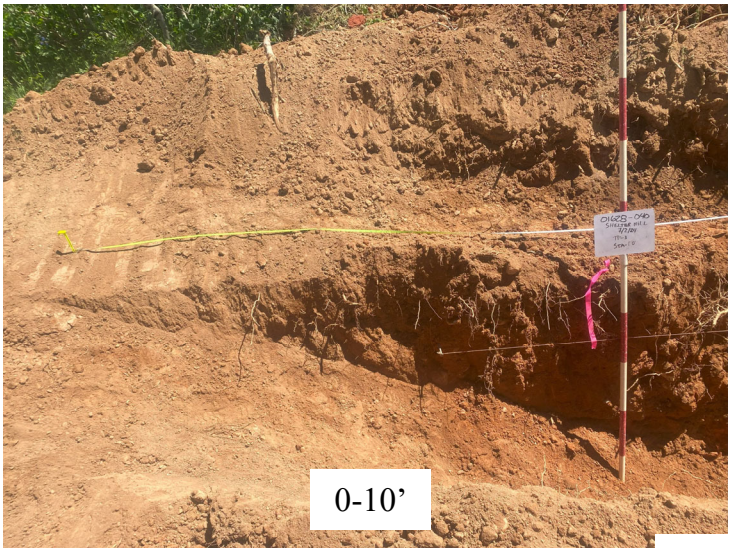
IGES

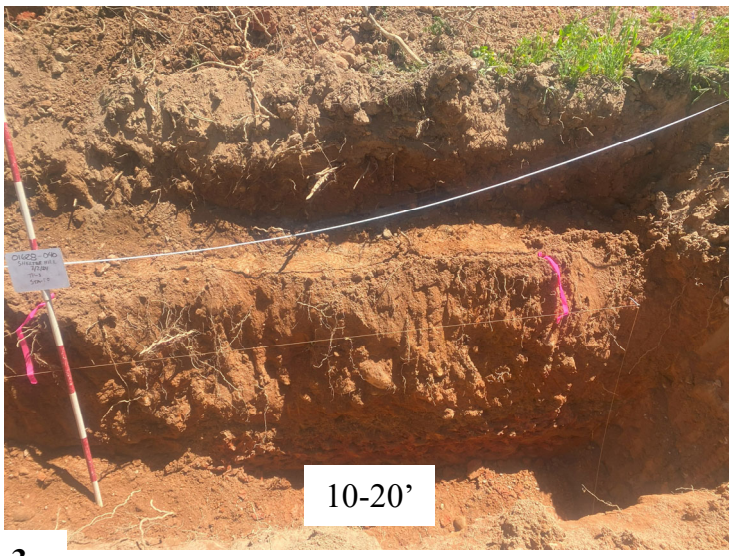
Project Number: 01628-040

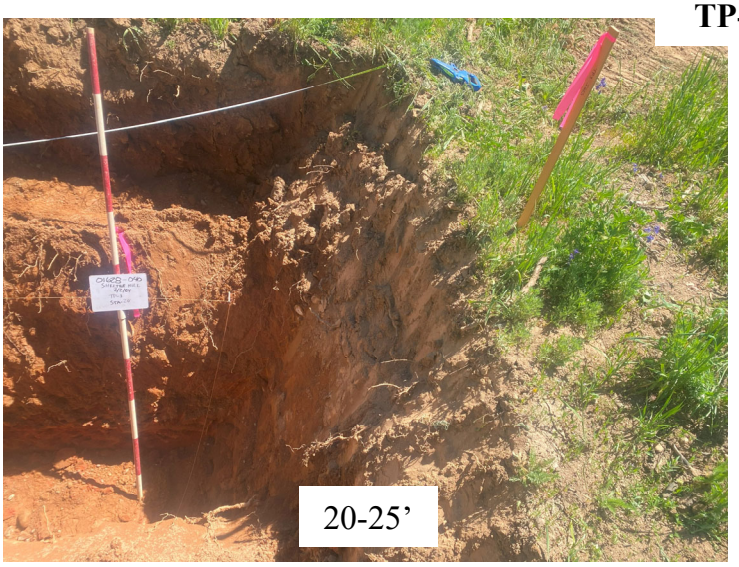
Geotechnical and Geologic Hazard Investigation
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

SELECT TEST PIT PHOTOS

Figure A-51a







Photos taken on July 3, 2024

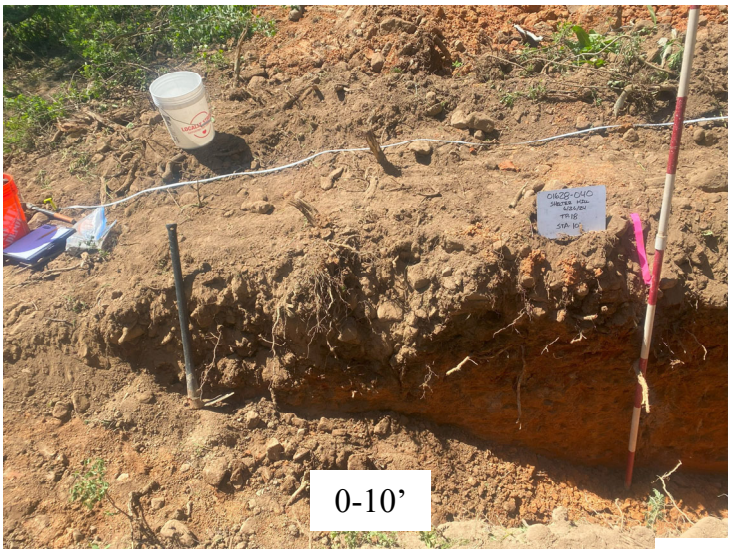
IGES

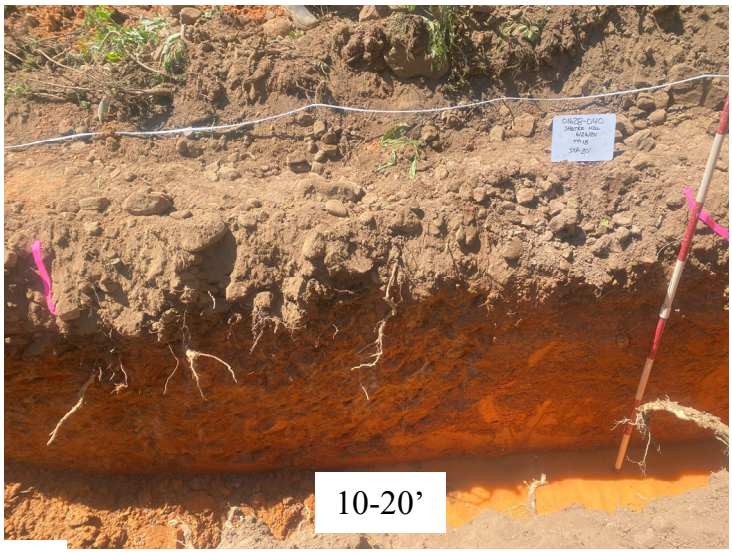
Project Number: 01628-040

Geotechnical and Geologic Hazard Investigation
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

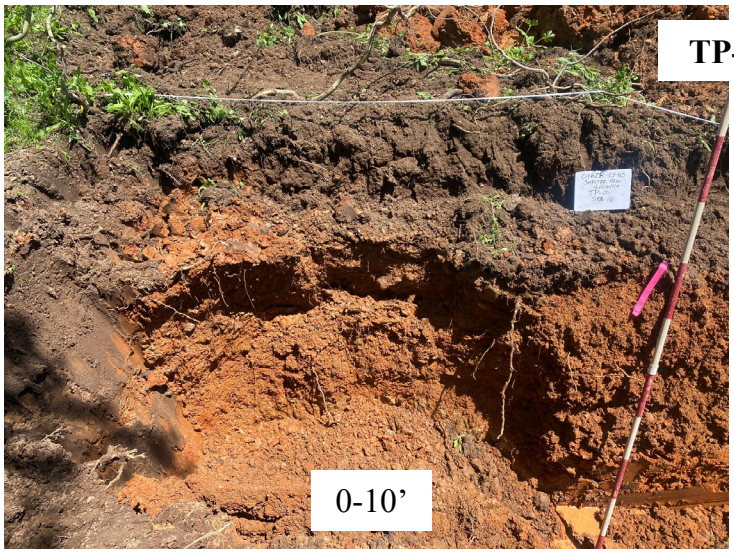
SELECT TEST PIT PHOTOS

Figure A-51b

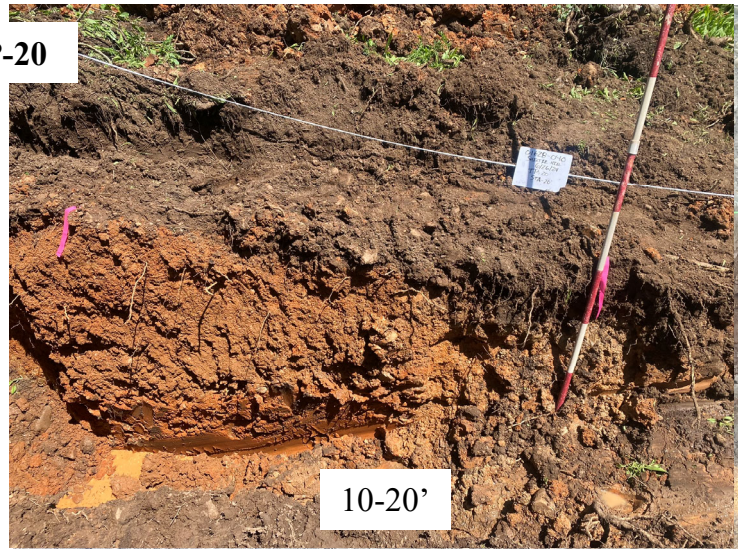




TP-18



TP-20



Photos taken on June 26, 2024

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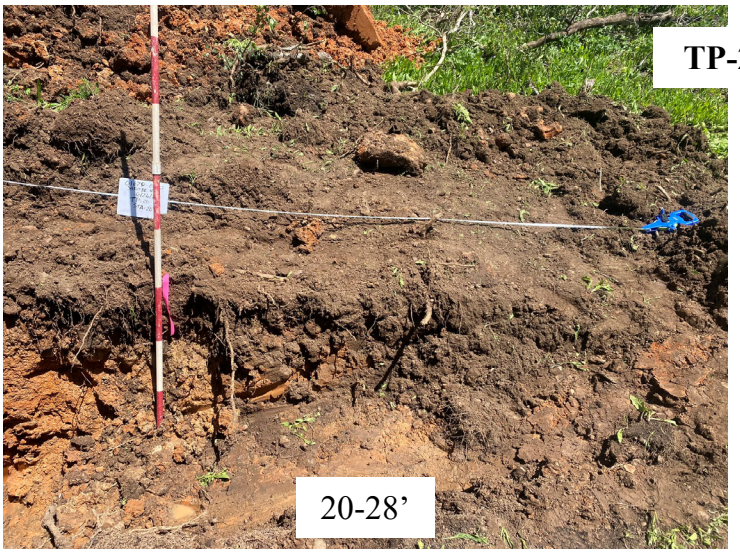
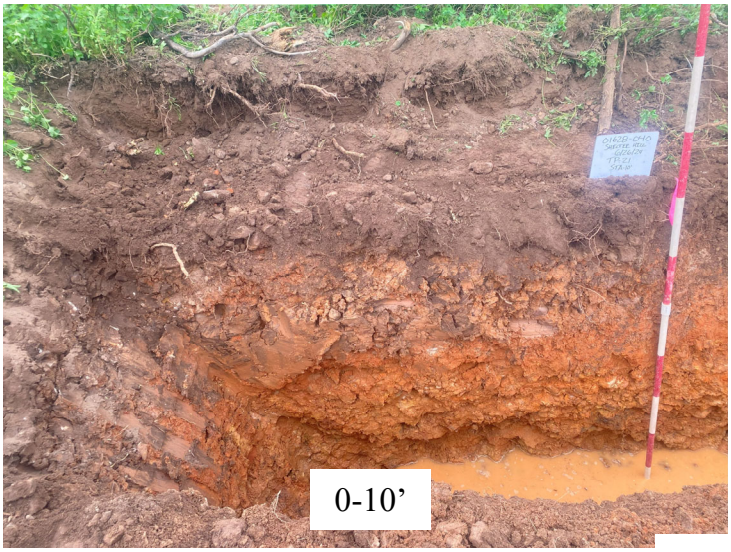
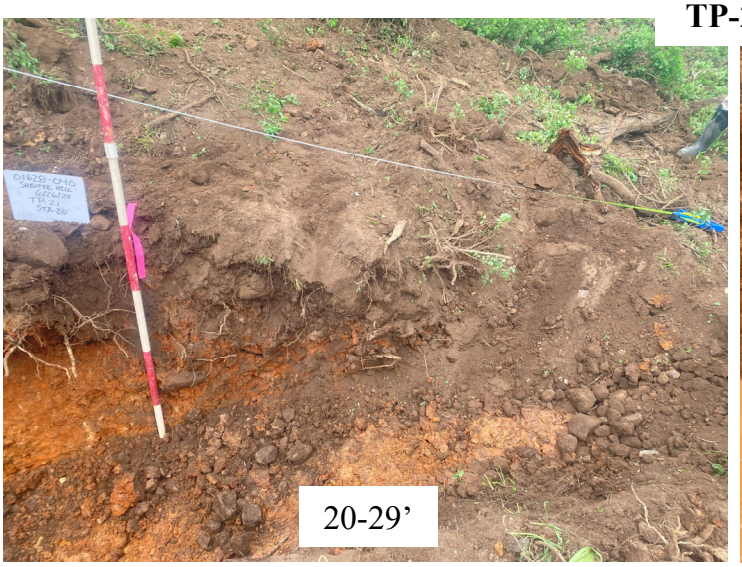
Geotechnical and Geologic Hazard Investigation
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

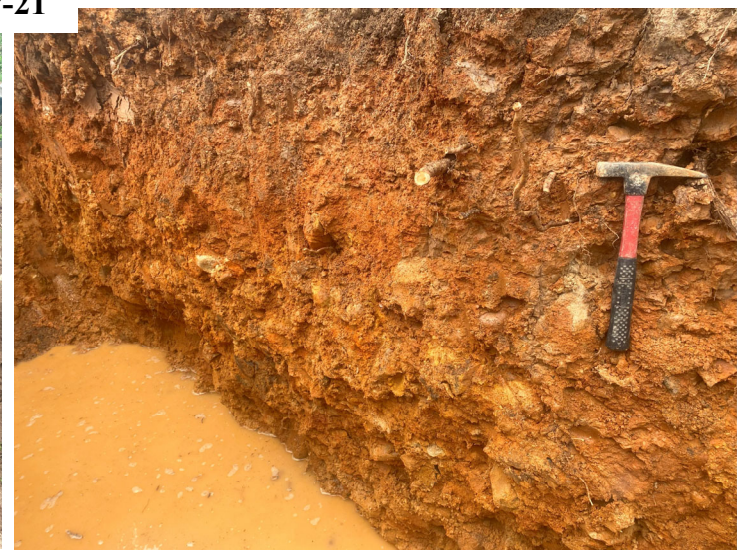
SELECT TEST PIT PHOTOS

Figure A-51c









Photos taken on June 26, 2024

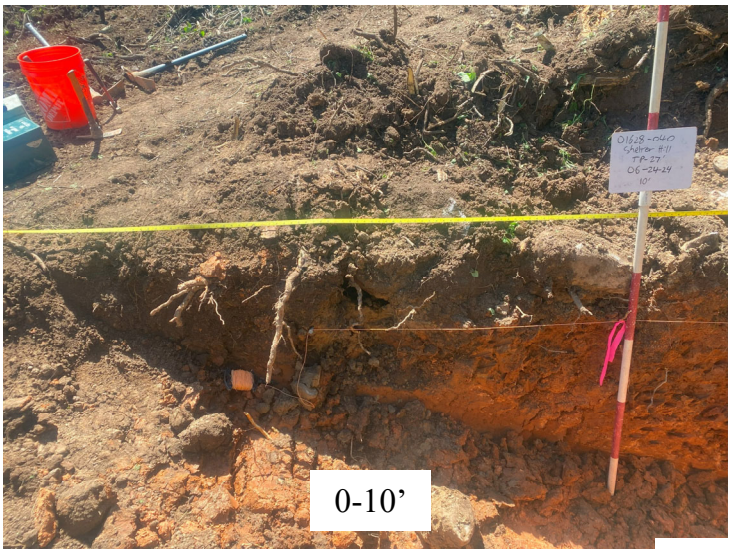
IGES

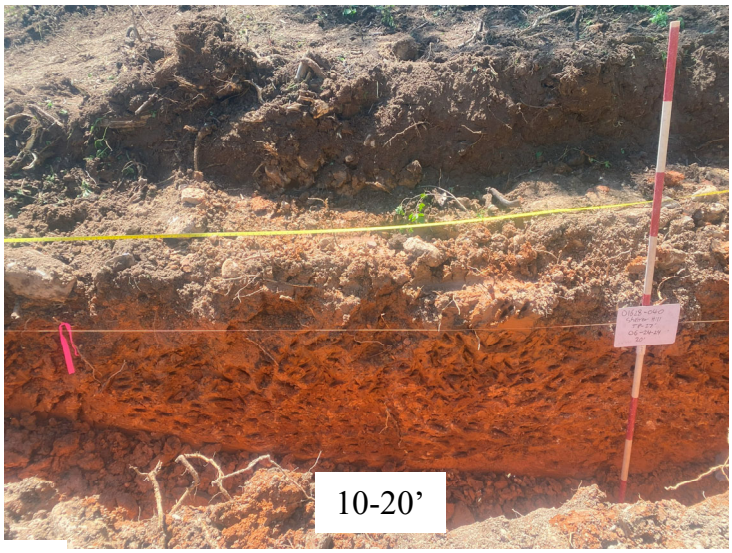
Project Number: 01628-040

Geotechnical and Geologic Hazard Investigation
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

SELECT TEST PIT PHOTOS

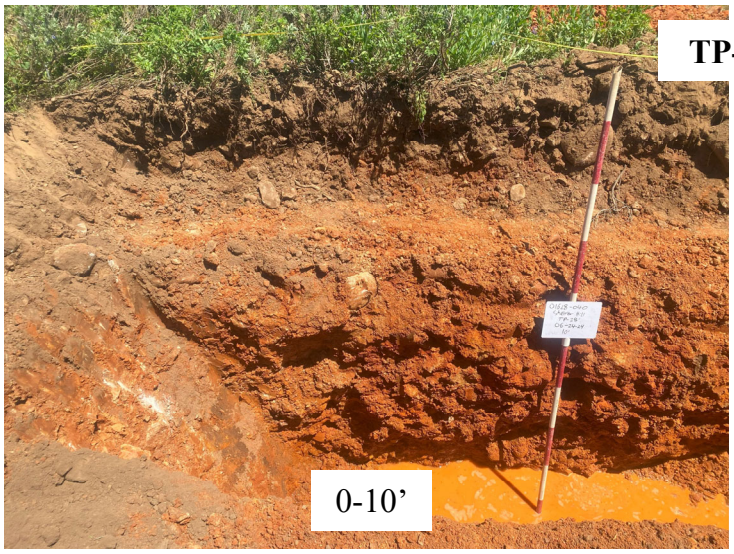
Figure A-51d

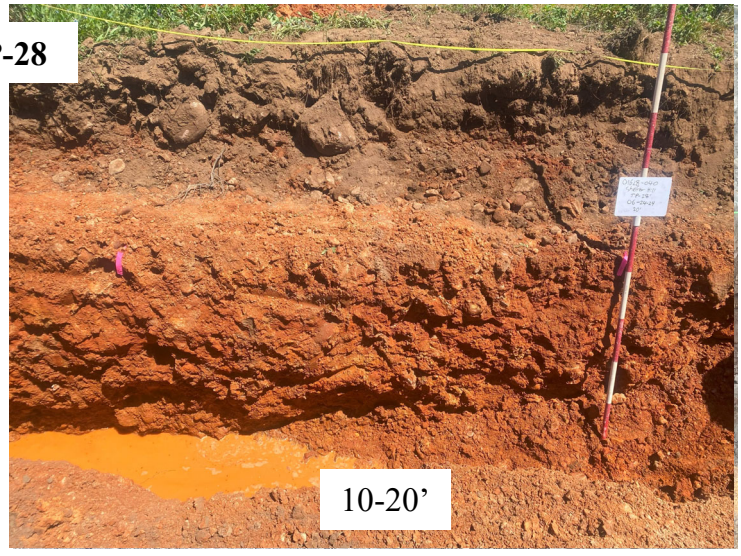




TP-27

TP-28





Photos taken on June 24, 2024

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Project Number: 01628-040

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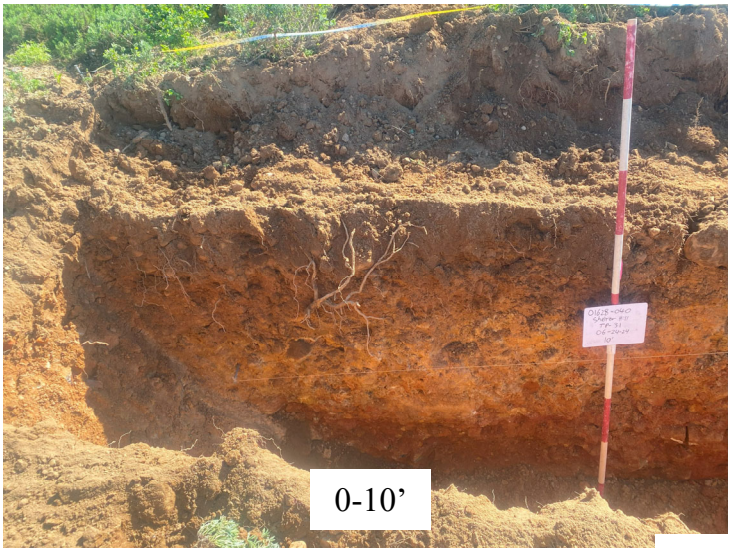
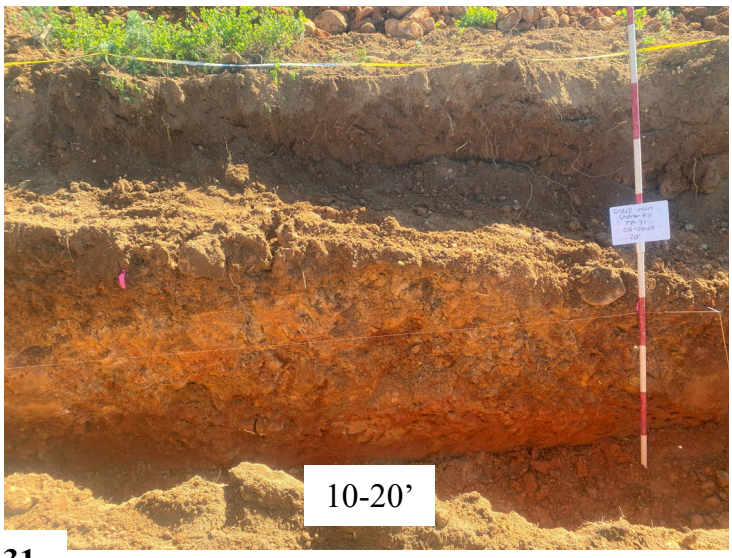
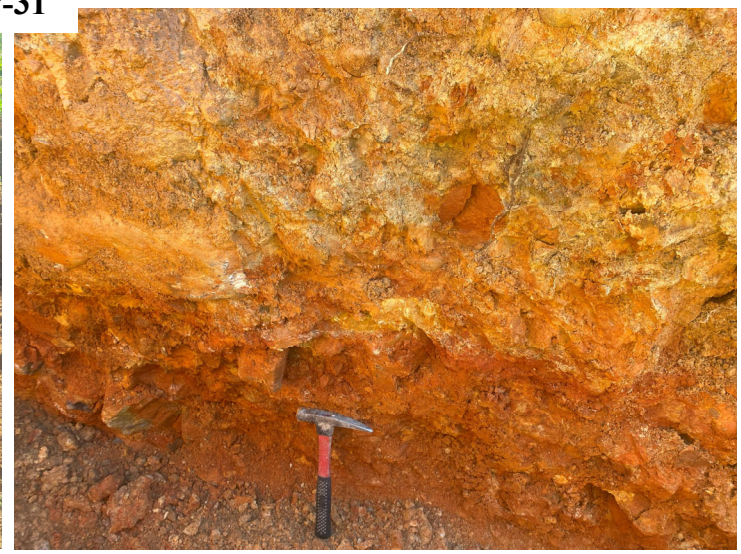
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

SELECT TEST PIT PHOTOS

Figure A-51e







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Shelter Hill Development
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Weber County, Utah

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Figure A-51f

APPENDIX B

Water Content and Unit Weight of Soil

(In General Accordance with ASTM D7263 Method B and D2216)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/5/2024
By: CJ/SE

Sample Info.	Boring No.	TP-27	TP-18	TP-11	TP-10	TP-8			
	Station	19	8	9.5	24	21			
	Depth	7.5'	5.0'	9.0'	4.0'	3.0'			
	Split	Yes	No	No	No	Yes			
	Split sieve	3/8"				3/8"			
Total sample (g)		3403.87				4274.29			
Moist coarse fraction (g)		9.18				363.84			
Moist split fraction (g)		3394.69				3910.45			
Unit Weight Data	Sample height, H (in)		5.757	4.604	5.667				
	Sample diameter, D (in)		2.404	2.404	2.403				
	Mass rings + wet soil (g)		1112.87	935.59	1091.56				
	Mass rings/tare (g)		237.22	236.18	238.31				
	Total unit wt., γ (pcf)		127.7	127.5	126.5				
Coarse Fraction	Wet soil + tare (g)	134.64				491.98			
	Dry soil + tare (g)	134.31				486.21			
	Tare (g)	124.51				128.14			
	Water content (%)	3.4				1.6			
Split Fraction	Wet soil + tare (g)	489.09	469.42	351.33	347.79	396.00			
	Dry soil + tare (g)	452.90	440.92	321.44	311.97	347.37			
	Tare (g)	211.93	226.25	127.28	128.79	127.21			
	Water content (%)	15.0	13.3	15.4	19.6	22.1			
Water content, ω (%)		**15.0**	**13.3**	**15.4**	**19.6**	**20.0**			
Dry unit weight, γ_d (pcf)			**112.7**	**110.5**	**105.8**				

Entered by:_____

Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/1/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-31
Station: 15
Depth: 7.0'
Description: Red lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

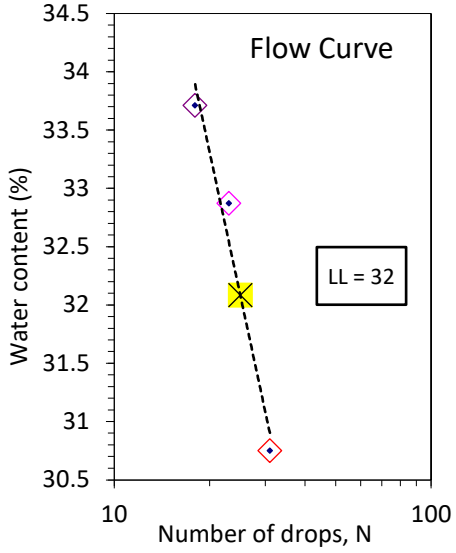
Plastic Limit

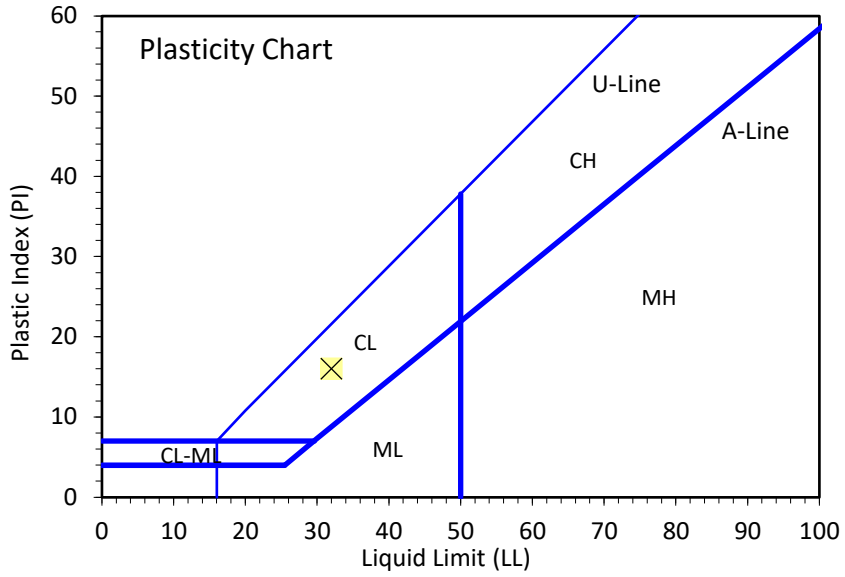
Determination No	1	2				
Wet Soil + Tare (g)	13.26	14.08				
Dry Soil + Tare (g)	12.39	13.19				
Water Loss (g)	0.87	0.89				
Tare (g)	7.04	7.53				
Dry Soil (g)	5.35	5.66				
Water Content, w (%)	16.26	15.72				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	23	18			
Wet Soil + Tare (g)	13.03	12.32	13.26			
Dry Soil + Tare (g)	11.68	11.13	11.78			
Water Loss (g)	1.35	1.19	1.48			
Tare (g)	7.29	7.51	7.39			
Dry Soil (g)	4.39	3.62	4.39			
Water Content, w (%)	30.75	32.87	33.71			
One-Point LL (%)		33				

Liquid Limit, LL (%)	**32**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**16**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/1/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-31
Station: 18
Depth: 7.5'
Description: Red lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved

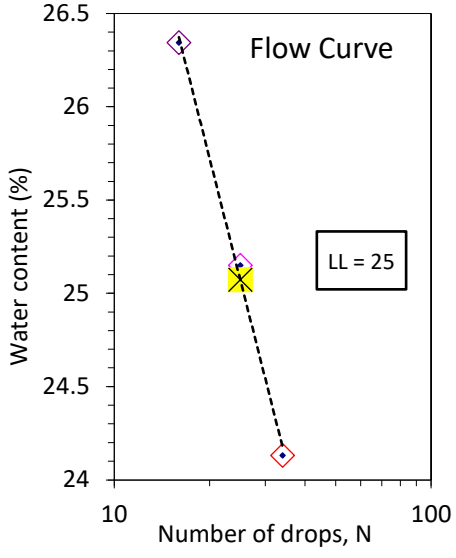
Plastic Limit

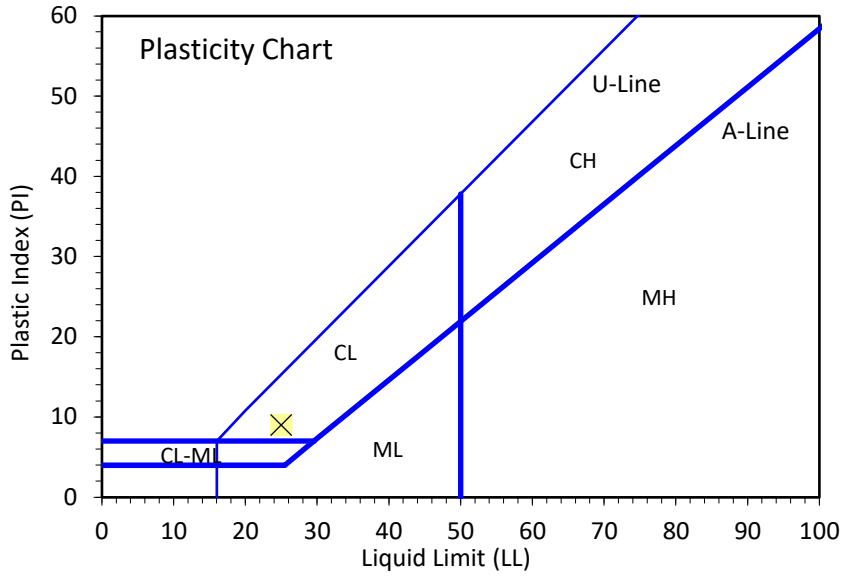
Determination No	1	2				
Wet Soil + Tare (g)	15.12	15.62				
Dry Soil + Tare (g)	14.13	14.53				
Water Loss (g)	0.99	1.09				
Tare (g)	7.73	7.63				
Dry Soil (g)	6.40	6.90				
Water Content, w (%)	15.47	15.80				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	25	16			
Wet Soil + Tare (g)	13.75	13.35	14.31			
Dry Soil + Tare (g)	12.50	12.09	12.79			
Water Loss (g)	1.25	1.26	1.52			
Tare (g)	7.32	7.08	7.02			
Dry Soil (g)	5.18	5.01	5.77			
Water Content, w (%)	24.13	25.15	26.34			
One-Point LL (%)		25				

Liquid Limit, LL (%)	**25**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**9**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/1/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-27
Station: 8
Depth: 4.0'
Description: Reddish brown fat clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved

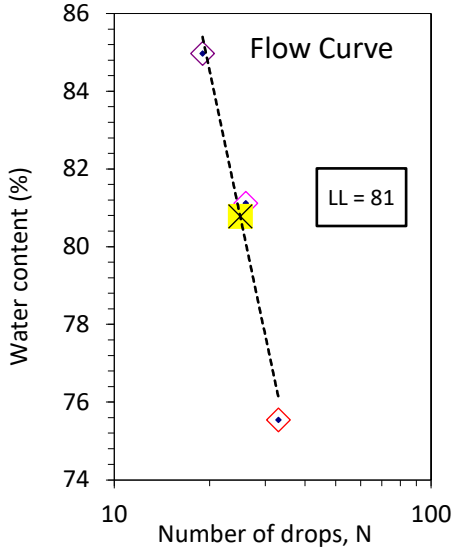
Plastic Limit

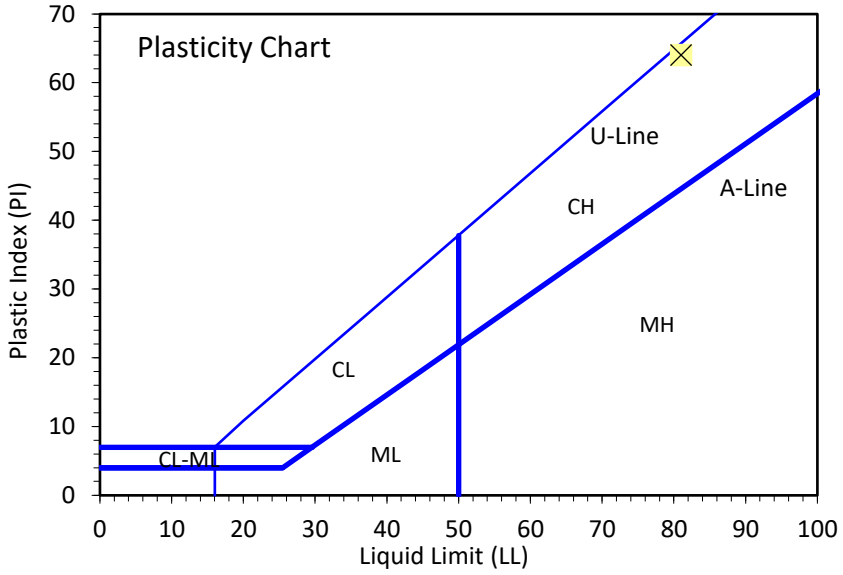
Determination No	1	2				
Wet Soil + Tare (g)	14.57	13.75				
Dry Soil + Tare (g)	13.50	12.83				
Water Loss (g)	1.07	0.92				
Tare (g)	7.03	7.28				
Dry Soil (g)	6.47	5.55				
Water Content, w (%)	16.54	16.58				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	26	19			
Wet Soil + Tare (g)	12.22	12.95	13.82			
Dry Soil + Tare (g)	10.12	10.33	10.88			
Water Loss (g)	2.10	2.62	2.94			
Tare (g)	7.34	7.10	7.42			
Dry Soil (g)	2.78	3.23	3.46			
Water Content, w (%)	75.54	81.11	84.97			
One-Point LL (%)		82				

Liquid Limit, LL (%)	**81**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**64**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/1/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-26
Station: 20
Depth: 5.0'
Description: Reddish brown lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved

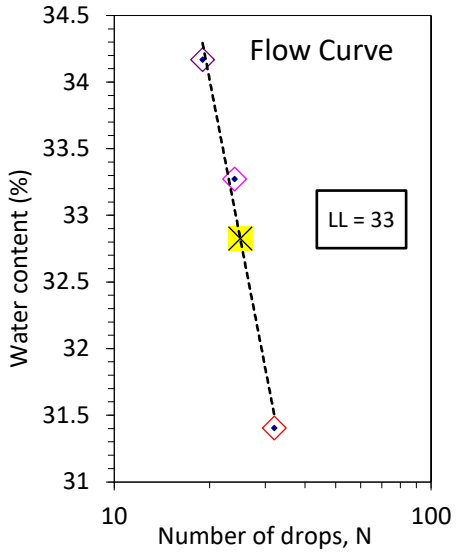
Plastic Limit

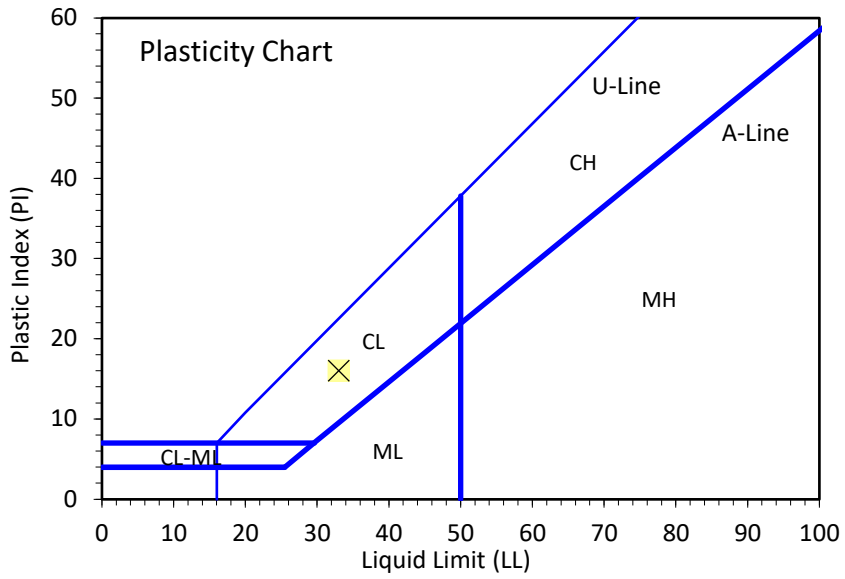
Determination No	1	2				
Wet Soil + Tare (g)	13.92	13.90				
Dry Soil + Tare (g)	13.02	12.91				
Water Loss (g)	0.90	0.99				
Tare (g)	7.54	7.07				
Dry Soil (g)	5.48	5.84				
Water Content, w (%)	16.42	16.95				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	24	19			
Wet Soil + Tare (g)	12.99	14.33	13.70			
Dry Soil + Tare (g)	11.58	12.51	12.20			
Water Loss (g)	1.41	1.82	1.50			
Tare (g)	7.09	7.04	7.81			
Dry Soil (g)	4.49	5.47	4.39			
Water Content, w (%)	31.40	33.27	34.17			
One-Point LL (%)		33				

Liquid Limit, LL (%)	**33**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**16**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/12/2024
By: BRR
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-25
Station: 8
Depth: 6.5'
Description: Red silty clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

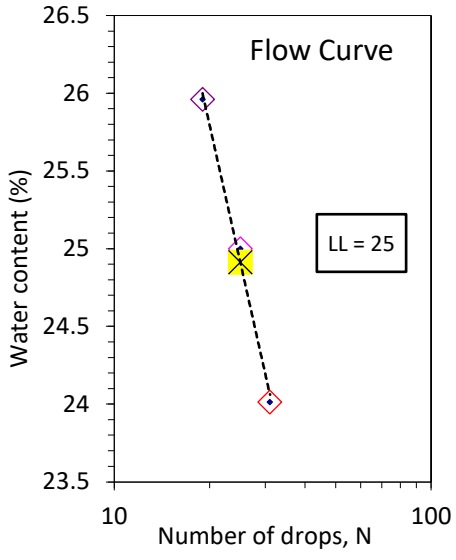
Plastic Limit

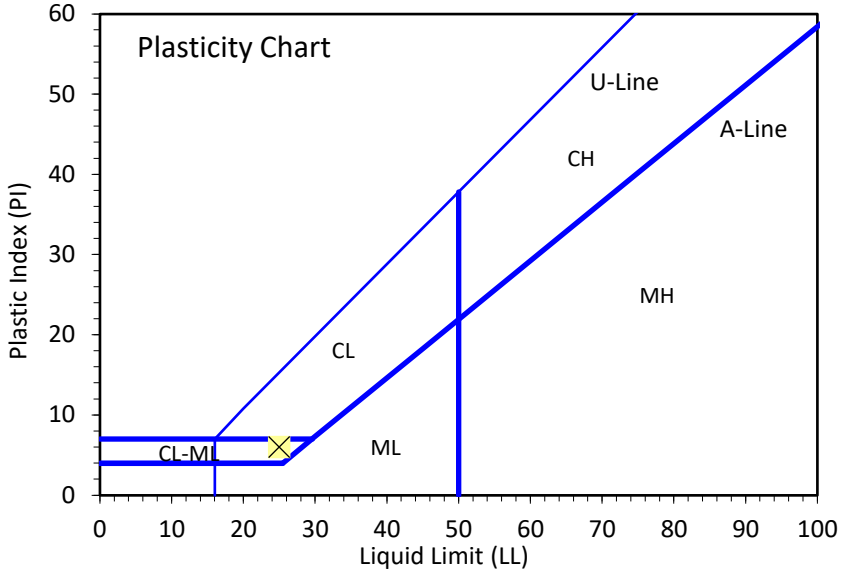
Determination No	1	2				
Wet Soil + Tare (g)	13.76	13.56				
Dry Soil + Tare (g)	12.75	12.55				
Water Loss (g)	1.01	1.01				
Tare (g)	7.46	7.10				
Dry Soil (g)	5.29	5.45				
Water Content, w (%)	19.09	18.53				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	25	19			
Wet Soil + Tare (g)	11.16	12.60	12.63			
Dry Soil + Tare (g)	10.37	11.60	11.55			
Water Loss (g)	0.79	1.00	1.08			
Tare (g)	7.08	7.60	7.39			
Dry Soil (g)	3.29	4.00	4.16			
Water Content, w (%)	24.01	25.00	25.96			
One-Point LL (%)		25				

Liquid Limit, LL (%)	**25**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**6**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-20
Station: 11
Depth: 4.5'
Description: Red lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

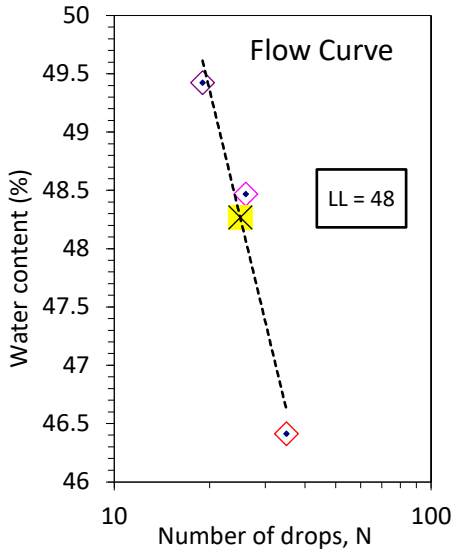
Plastic Limit

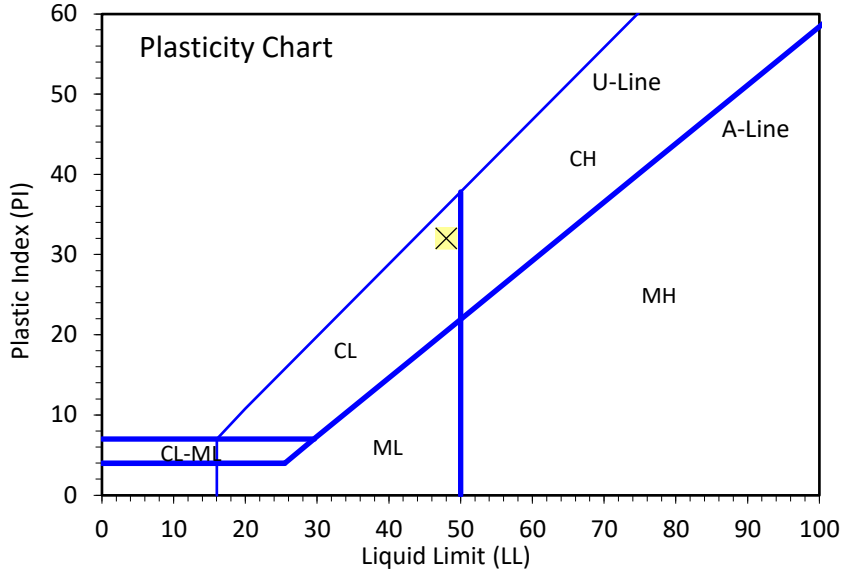
Determination No	1	2				
Wet Soil + Tare (g)	13.69	14.60				
Dry Soil + Tare (g)	12.81	13.56				
Water Loss (g)	0.88	1.04				
Tare (g)	7.07	7.10				
Dry Soil (g)	5.74	6.46				
Water Content, w (%)	15.33	16.10				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	26	19			
Wet Soil + Tare (g)	13.96	15.30	13.99			
Dry Soil + Tare (g)	11.89	12.61	11.85			
Water Loss (g)	2.07	2.69	2.14			
Tare (g)	7.43	7.06	7.52			
Dry Soil (g)	4.46	5.55	4.33			
Water Content, w (%)	46.41	48.47	49.42			
One-Point LL (%)		49				

Liquid Limit, LL (%)	**48**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**32**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-18
Station: 8
Depth: 5.0'
Description: Reddish brown lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

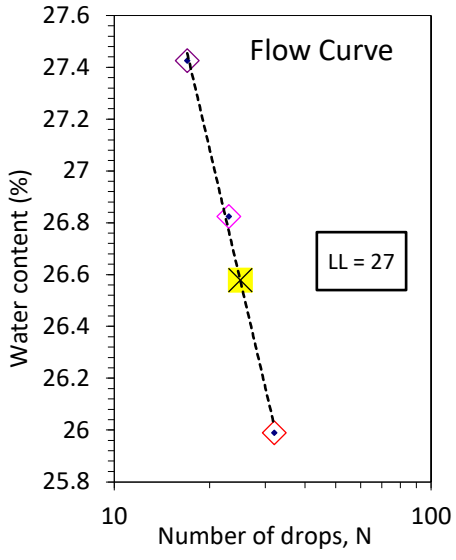
Plastic Limit

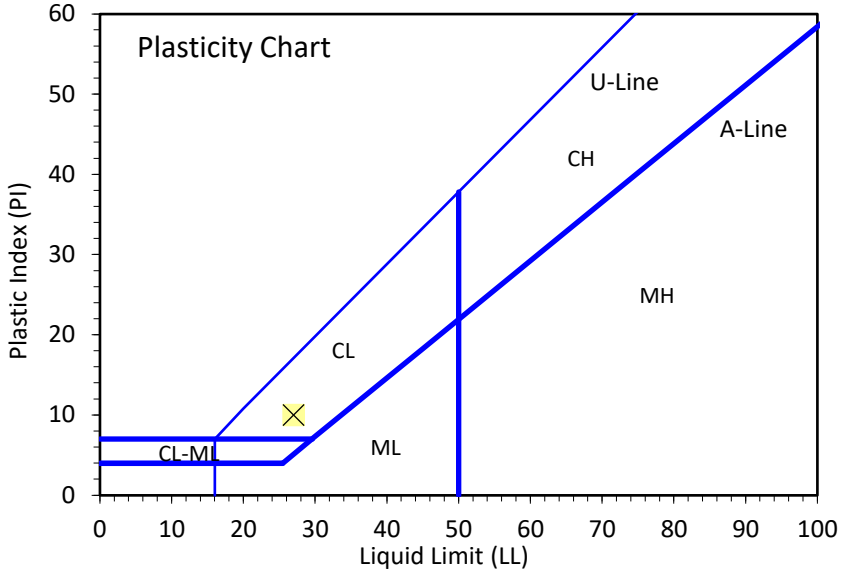
Determination No	1	2				
Wet Soil + Tare (g)	13.79	14.57				
Dry Soil + Tare (g)	12.81	13.45				
Water Loss (g)	0.98	1.12				
Tare (g)	7.06	7.02				
Dry Soil (g)	5.75	6.43				
Water Content, w (%)	17.04	17.42				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	23	17			
Wet Soil + Tare (g)	14.36	13.88	14.30			
Dry Soil + Tare (g)	12.85	12.52	12.83			
Water Loss (g)	1.51	1.36	1.47			
Tare (g)	7.04	7.45	7.47			
Dry Soil (g)	5.81	5.07	5.36			
Water Content, w (%)	25.99	26.82	27.43			
One-Point LL (%)		27				

Liquid Limit, LL (%)	**27**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**10**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/7/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-16
Station: 11
Depth: 5.5'
Description: Red silty clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

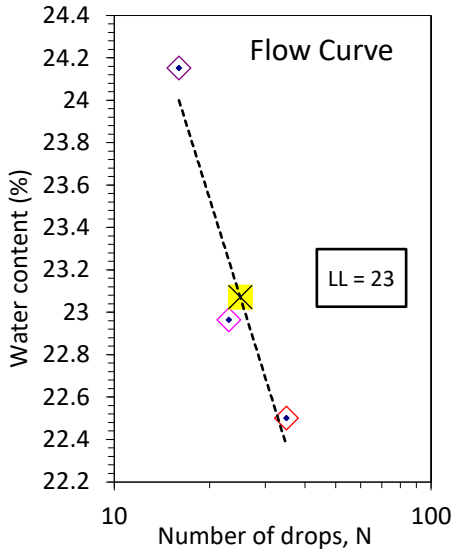
Plastic Limit

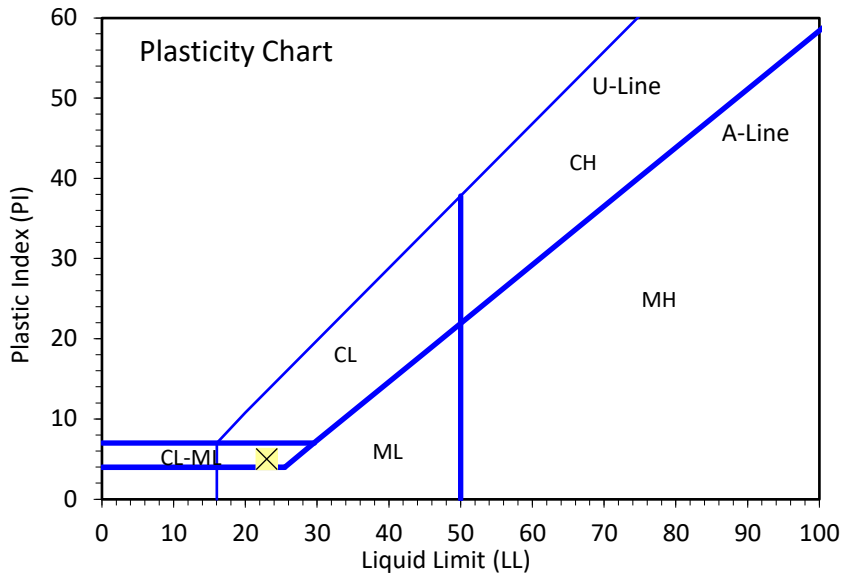
Determination No	1	2				
Wet Soil + Tare (g)	14.34	13.37				
Dry Soil + Tare (g)	13.22	12.40				
Water Loss (g)	1.12	0.97				
Tare (g)	7.09	7.02				
Dry Soil (g)	6.13	5.38				
Water Content, w (%)	18.27	18.03				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	23	16			
Wet Soil + Tare (g)	14.70	12.95	13.56			
Dry Soil + Tare (g)	13.35	11.85	12.35			
Water Loss (g)	1.35	1.10	1.21			
Tare (g)	7.35	7.06	7.34			
Dry Soil (g)	6.00	4.79	5.01			
Water Content, w (%)	22.50	22.96	24.15			
One-Point LL (%)		23				

Liquid Limit, LL (%)	**23**
Plastic Limit, PL (%)	**18**
Plasticity Index, PI (%)	**5**





Entered by:_____
Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/2/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-13
Station: 25
Depth: 8.0'
Description: Red lean clay

Preparation method: Wet
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Wet sieved

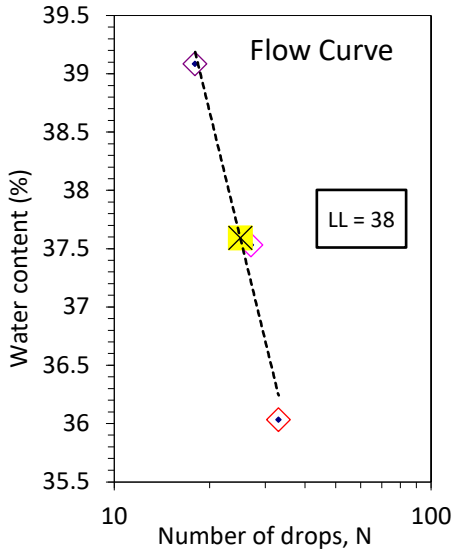
Plastic Limit

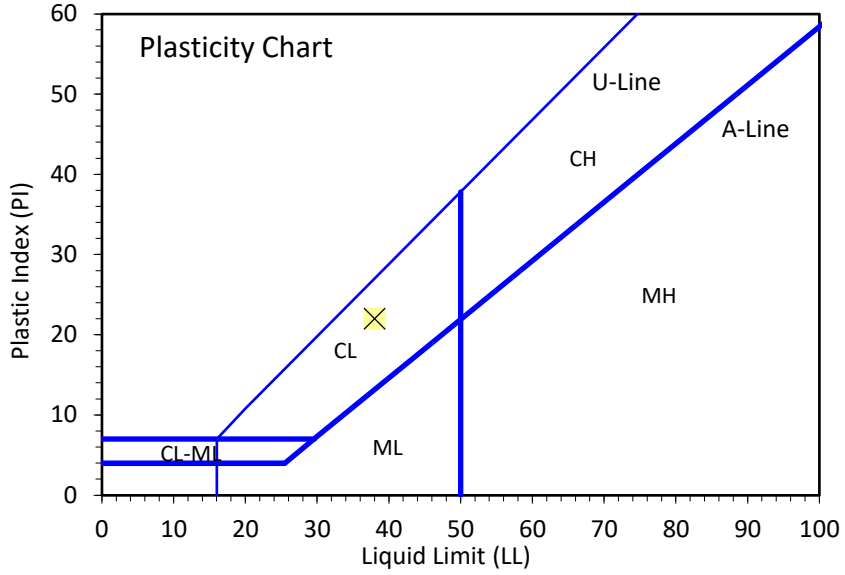
Determination No	1	2				
Wet Soil + Tare (g)	14.94	14.28				
Dry Soil + Tare (g)	13.96	13.36				
Water Loss (g)	0.98	0.92				
Tare (g)	7.73	7.54				
Dry Soil (g)	6.23	5.82				
Water Content, w (%)	15.73	15.81				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	27	18			
Wet Soil + Tare (g)	13.41	12.81	13.79			
Dry Soil + Tare (g)	11.72	11.32	11.91			
Water Loss (g)	1.69	1.49	1.88			
Tare (g)	7.03	7.35	7.10			
Dry Soil (g)	4.69	3.97	4.81			
Water Content, w (%)	36.03	37.53	39.09			
One-Point LL (%)		38				

Liquid Limit, LL (%)	**38**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**22**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/9/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-11
Station: 9.5
Depth: 9.0'
Description: Red lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

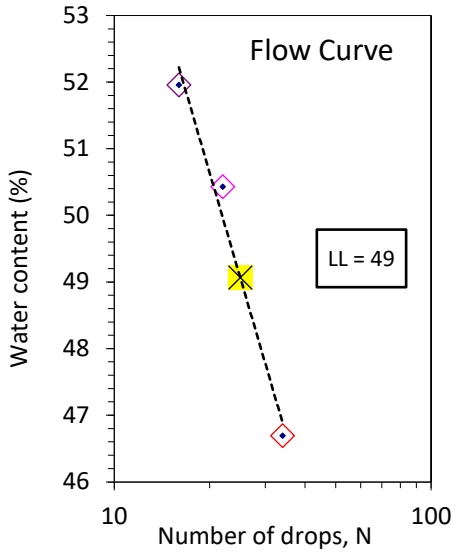
Plastic Limit

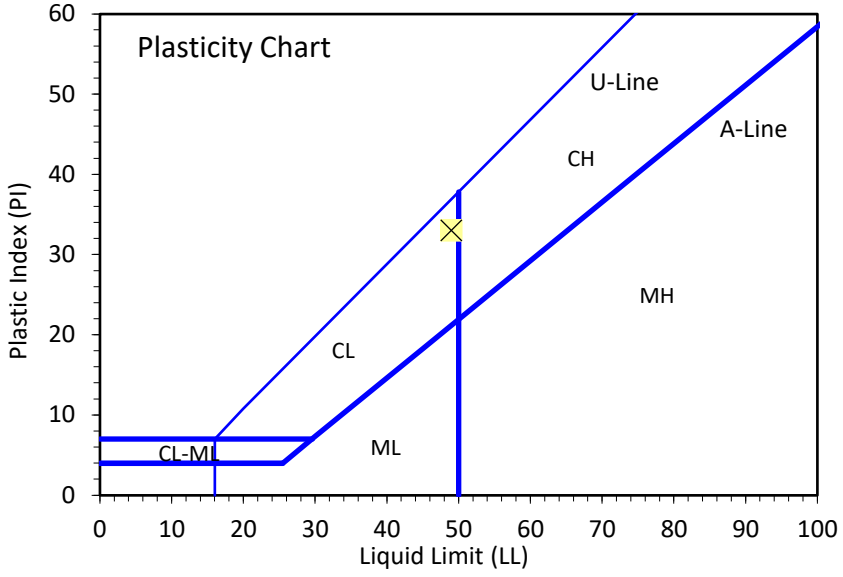
Determination No	1	2				
Wet Soil + Tare (g)	13.72	14.20				
Dry Soil + Tare (g)	12.77	13.29				
Water Loss (g)	0.95	0.91				
Tare (g)	7.05	7.69				
Dry Soil (g)	5.72	5.60				
Water Content, w (%)	16.61	16.25				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	34	22	16			
Wet Soil + Tare (g)	13.94	14.48	14.38			
Dry Soil + Tare (g)	11.75	12.14	11.99			
Water Loss (g)	2.19	2.34	2.39			
Tare (g)	7.06	7.50	7.39			
Dry Soil (g)	4.69	4.64	4.60			
Water Content, w (%)	46.70	50.43	51.96			
One-Point LL (%)		50				

Liquid Limit, LL (%)	**49**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**33**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/7/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-10
Station: 24
Depth: 4.0'
Description: Red fat clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

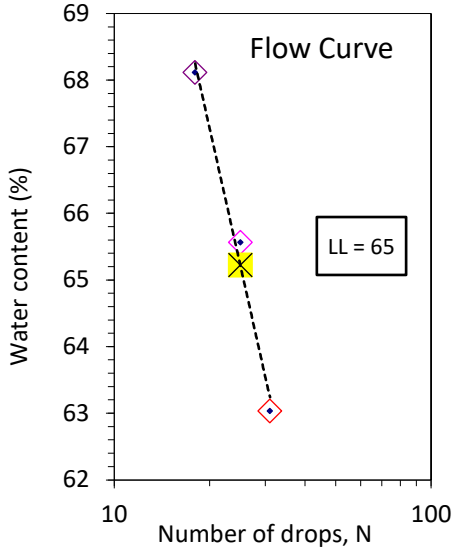
Plastic Limit

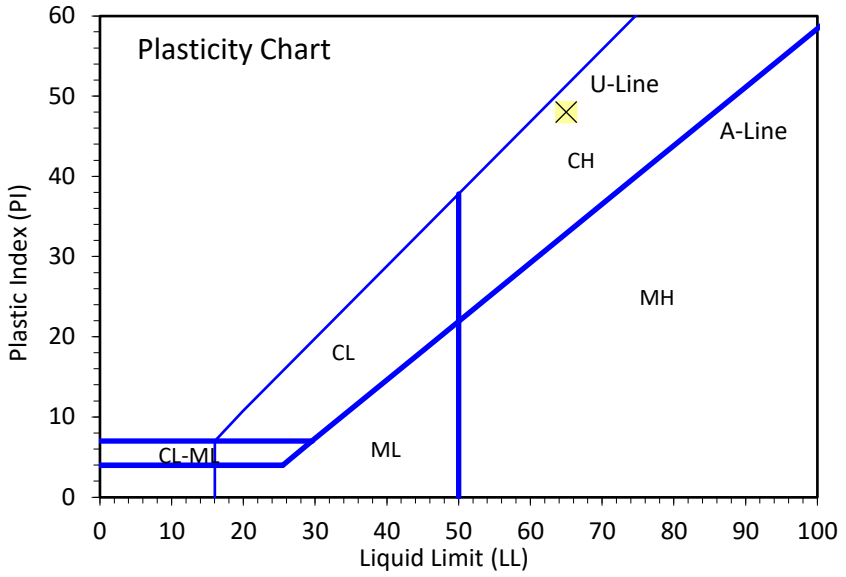
Determination No	1	2				
Wet Soil + Tare (g)	13.75	13.37				
Dry Soil + Tare (g)	12.80	12.47				
Water Loss (g)	0.95	0.90				
Tare (g)	7.11	7.08				
Dry Soil (g)	5.69	5.39				
Water Content, w (%)	16.70	16.70				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	25	18			
Wet Soil + Tare (g)	13.91	14.80	14.07			
Dry Soil + Tare (g)	11.25	12.02	11.25			
Water Loss (g)	2.66	2.78	2.82			
Tare (g)	7.03	7.78	7.11			
Dry Soil (g)	4.22	4.24	4.14			
Water Content, w (%)	63.03	65.57	68.12			
One-Point LL (%)		66				

Liquid Limit, LL (%)	**65**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**48**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/7/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-9
Station: 24
Depth: 9.0'
Description: Reddish brown lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

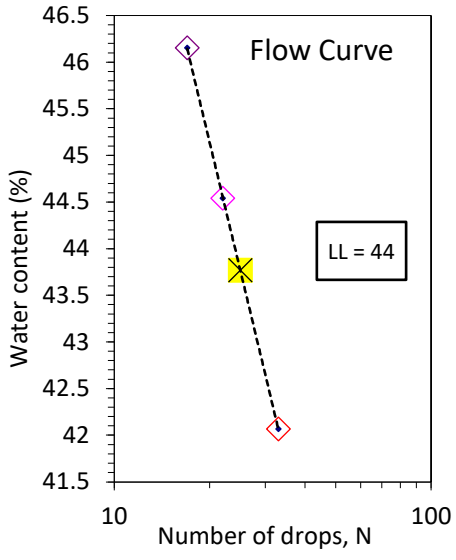
Plastic Limit

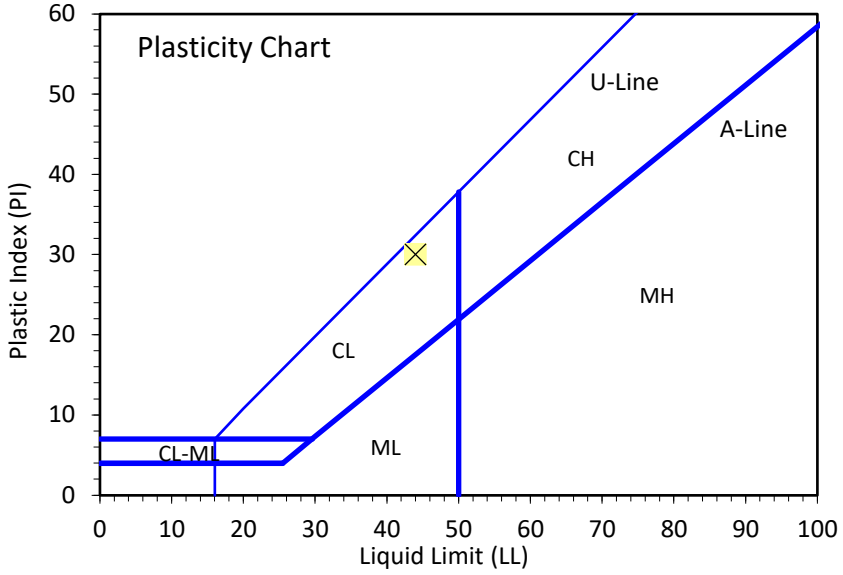
Determination No	1	2				
Wet Soil + Tare (g)	13.46	14.15				
Dry Soil + Tare (g)	12.68	13.33				
Water Loss (g)	0.78	0.82				
Tare (g)	7.09	7.61				
Dry Soil (g)	5.59	5.72				
Water Content, w (%)	13.95	14.34				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	33	22	17			
Wet Soil + Tare (g)	13.02	14.12	13.66			
Dry Soil + Tare (g)	11.27	12.04	11.68			
Water Loss (g)	1.75	2.08	1.98			
Tare (g)	7.11	7.37	7.39			
Dry Soil (g)	4.16	4.67	4.29			
Water Content, w (%)	42.07	44.54	46.15			
One-Point LL (%)		44				

Liquid Limit, LL (%)	**44**
Plastic Limit, PL (%)	**14**
Plasticity Index, PI (%)	**30**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/5/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-8
Station: 21
Depth: 3.0'
Description: Brownish red fat clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

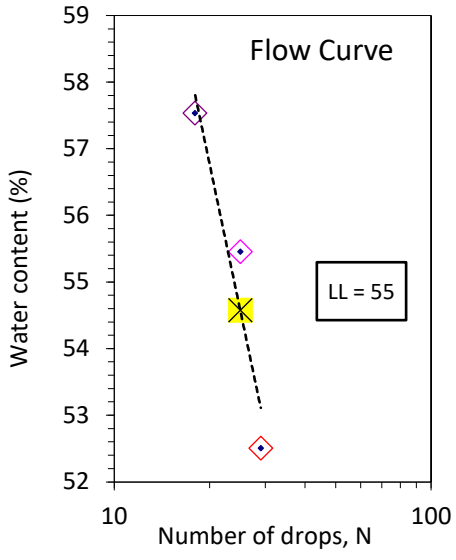
Plastic Limit

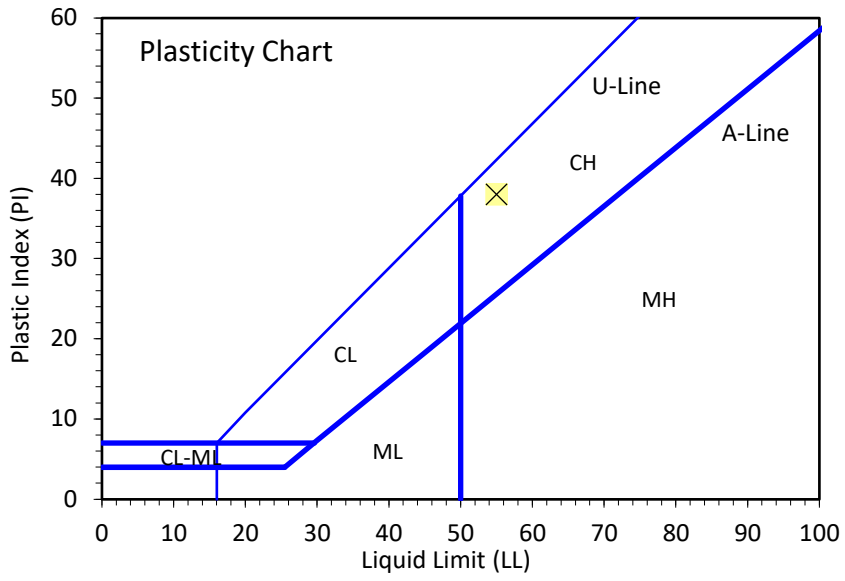
Determination No	1	2				
Wet Soil + Tare (g)	14.16	14.43				
Dry Soil + Tare (g)	13.23	13.42				
Water Loss (g)	0.93	1.01				
Tare (g)	7.73	7.53				
Dry Soil (g)	5.50	5.89				
Water Content, w (%)	16.91	17.15				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	29	25	18			
Wet Soil + Tare (g)	13.50	14.35	14.29			
Dry Soil + Tare (g)	11.30	11.91	11.77			
Water Loss (g)	2.20	2.44	2.52			
Tare (g)	7.11	7.51	7.39			
Dry Soil (g)	4.19	4.40	4.38			
Water Content, w (%)	52.51	55.45	57.53			
One-Point LL (%)	53	55				

Liquid Limit, LL (%)	**55**
Plastic Limit, PL (%)	**17**
Plasticity Index, PI (%)	**38**





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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/9/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-6
Station: 8
Depth: 5.5'
Description: Red lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

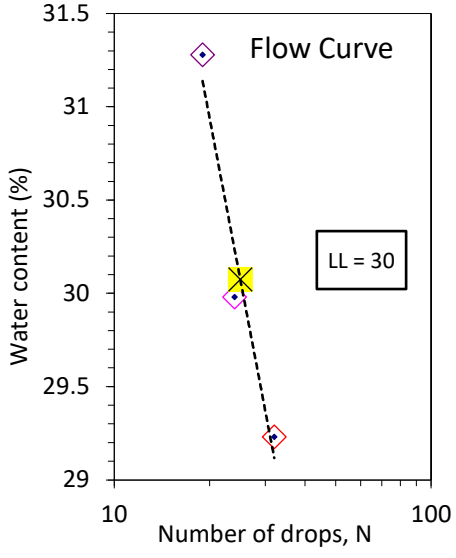
Plastic Limit

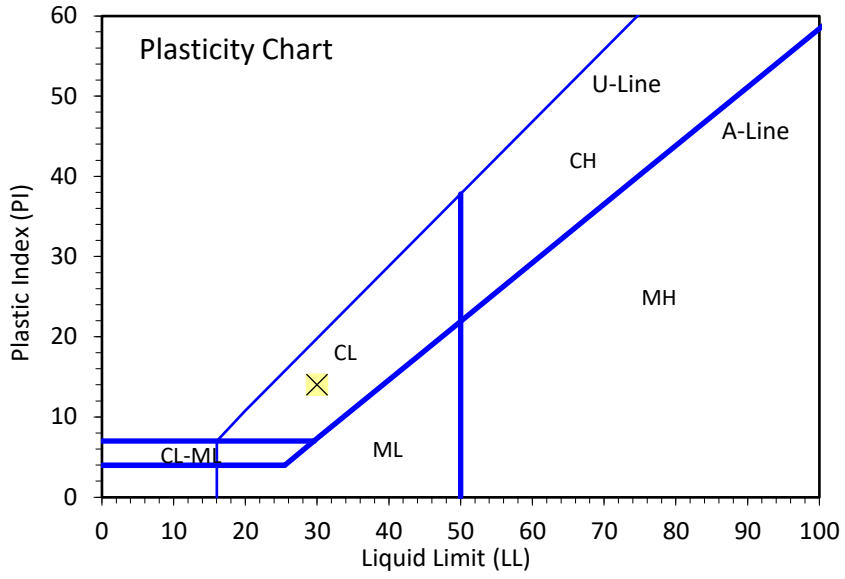
Determination No	1	2				
Wet Soil + Tare (g)	13.52	13.83				
Dry Soil + Tare (g)	12.61	12.94				
Water Loss (g)	0.91	0.89				
Tare (g)	7.05	7.49				
Dry Soil (g)	5.56	5.45				
Water Content, w (%)	16.37	16.33				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	32	24	19			
Wet Soil + Tare (g)	14.02	14.13	12.87			
Dry Soil + Tare (g)	12.50	12.58	11.50			
Water Loss (g)	1.52	1.55	1.37			
Tare (g)	7.30	7.41	7.12			
Dry Soil (g)	5.20	5.17	4.38			
Water Content, w (%)	29.23	29.98	31.28			
One-Point LL (%)		30				

Liquid Limit, LL (%)	**30**
Plastic Limit, PL (%)	**16**
Plasticity Index, PI (%)	**14**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/9/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-4
Station: 12
Depth: 6.0'
Description: Red lean clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

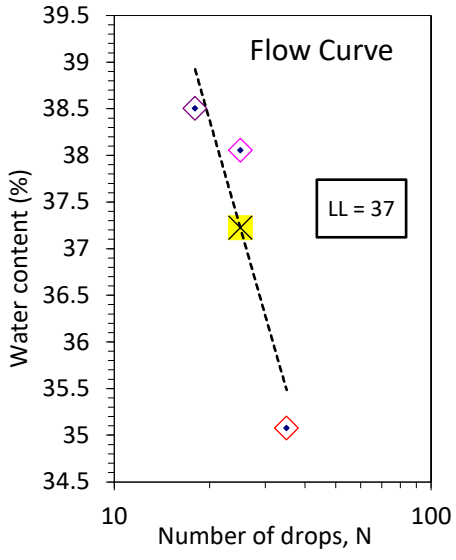
Plastic Limit

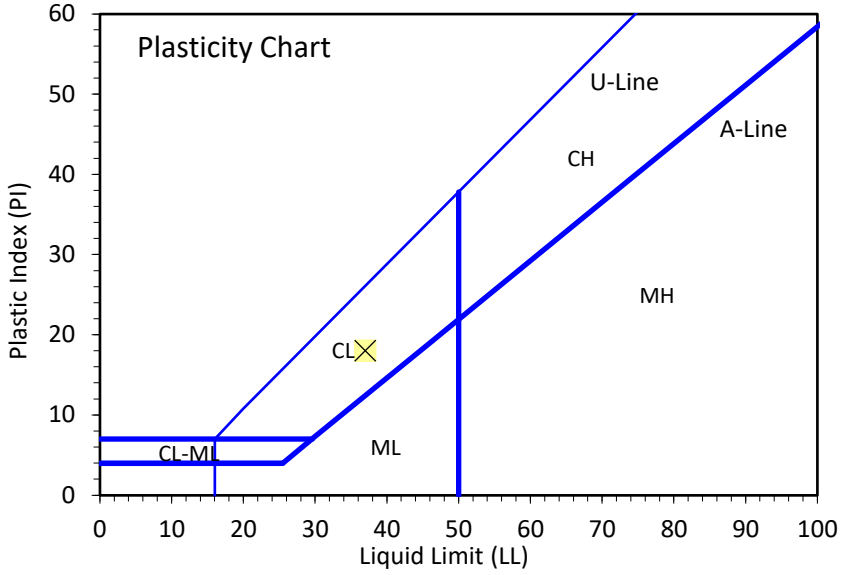
Determination No	1	2				
Wet Soil + Tare (g)	13.39	14.06				
Dry Soil + Tare (g)	12.40	13.03				
Water Loss (g)	0.99	1.03				
Tare (g)	7.08	7.55				
Dry Soil (g)	5.32	5.48				
Water Content, w (%)	18.61	18.80				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	35	25	18			
Wet Soil + Tare (g)	13.62	14.22	14.84			
Dry Soil + Tare (g)	12.01	12.42	12.78			
Water Loss (g)	1.61	1.80	2.06			
Tare (g)	7.42	7.69	7.43			
Dry Soil (g)	4.59	4.73	5.35			
Water Content, w (%)	35.08	38.05	38.50			
One-Point LL (%)		38				

Liquid Limit, LL (%)	**37**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**18**





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Reviewed:_____

Liquid Limit, Plastic Limit, and Plasticity Index of Soils

(ASTM D4318)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/2/2024
By: RH
Grooving tool type: Plastic
Liquid limit device: Mechanical
Rolling method: Hand

Boring No.: TP-3
Station: 14
Depth: 7.5'
Description: Red fat clay

Preparation method: Air Dry
Liquid limit test method: Multipoint
Screened over No.40: Yes
Larger particles removed: Dry sieved

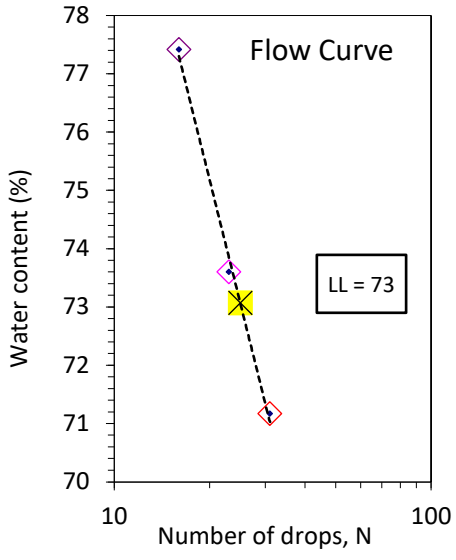
Plastic Limit

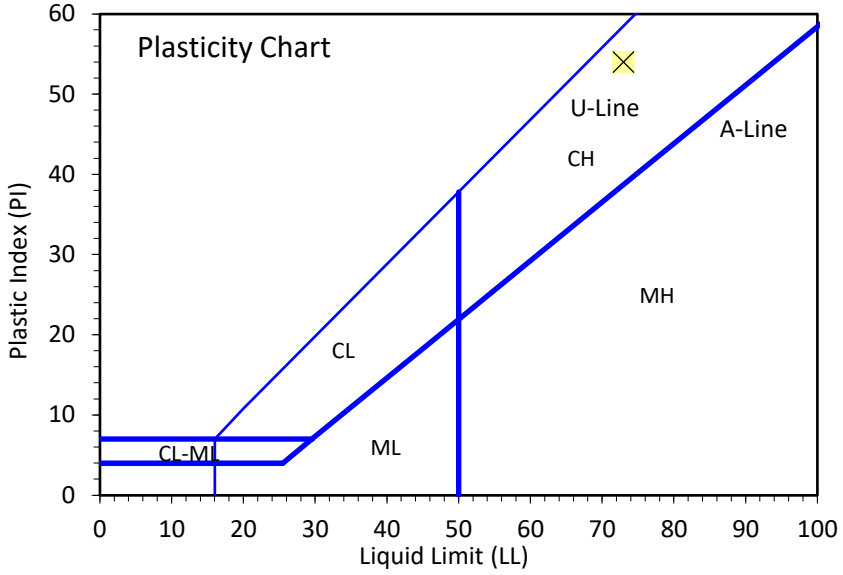
Determination No	1	2				
Wet Soil + Tare (g)	13.21	14.22				
Dry Soil + Tare (g)	12.23	13.12				
Water Loss (g)	0.98	1.10				
Tare (g)	7.10	7.48				
Dry Soil (g)	5.13	5.64				
Water Content, w (%)	19.10	19.50				

Liquid Limit

Determination No	1	2	3			
Number of Drops, N	31	23	16			
Wet Soil + Tare (g)	13.63	13.05	13.45			
Dry Soil + Tare (g)	10.89	10.68	10.81			
Water Loss (g)	2.74	2.37	2.64			
Tare (g)	7.04	7.46	7.40			
Dry Soil (g)	3.85	3.22	3.41			
Water Content, w (%)	71.17	73.60	77.42			
One-Point LL (%)		73				

Liquid Limit, LL (%)	**73**
Plastic Limit, PL (%)	**19**
Plasticity Index, PI (%)	**54**





Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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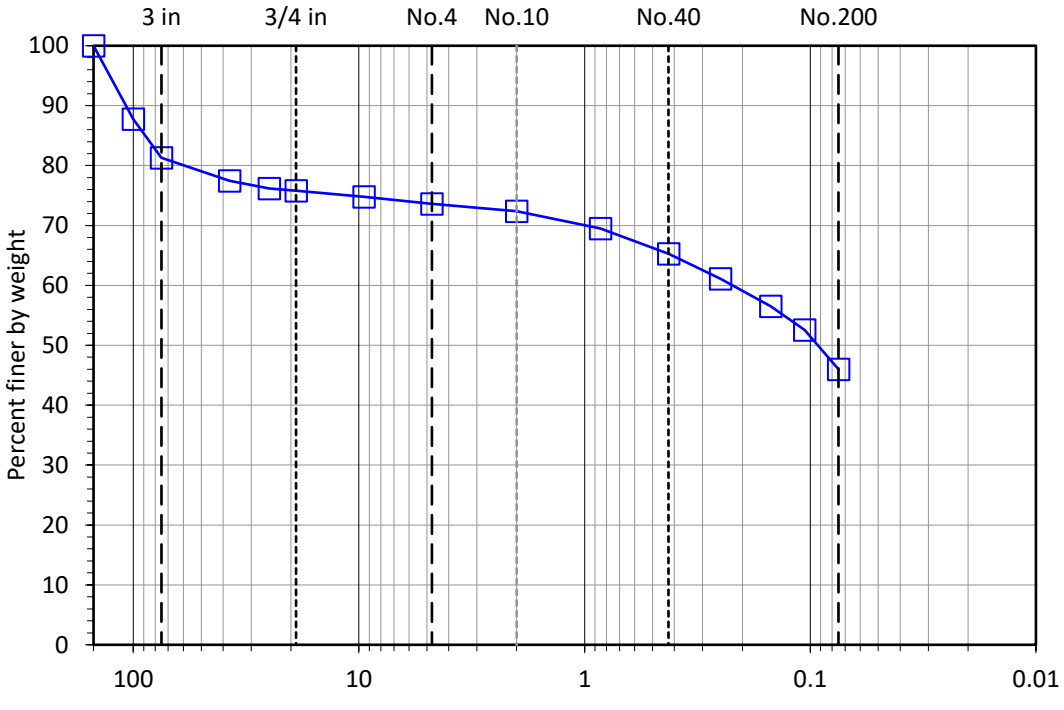
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 7/31/2024
By: JJ

Boring No.: TP-31
Station: 15
Depth: 7.0'
Description: Red clayey sand with gravel

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	24166.7	22030.1
+3/8" Coarse fraction (g):	5609.0	5555.6
-3/8" Split fraction (g):	263.24	233.69
Split fraction:	0.748	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	6530.9	391.14
Dry soil + tare (g):	6475.5	361.59
Tare (g):	714.4	127.90
Water content (%):	1.0	12.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	100.0	
4"	2698.8	100	87.7	
3"	4123.5	75	81.3	
1.5"	4961.3	37.5	77.5	
1"	5250.1	25	76.2	
3/4"	5335.0	19	75.8	
3/8"	5555.6	9.5	74.8	←Split
No.4	3.60	4.75	73.6	
No.10	7.54	2	72.4	
No.20	16.56	0.85	69.5	
No.40	29.64	0.425	65.3	
No.60	42.69	0.25	61.1	
No.100	57.01	0.15	56.5	
No.140	69.39	0.106	52.6	
No.200	89.92	0.075	46.0	



Gravel (%): 26.4
Sand (%): 27.6
Fines (%): 46.0

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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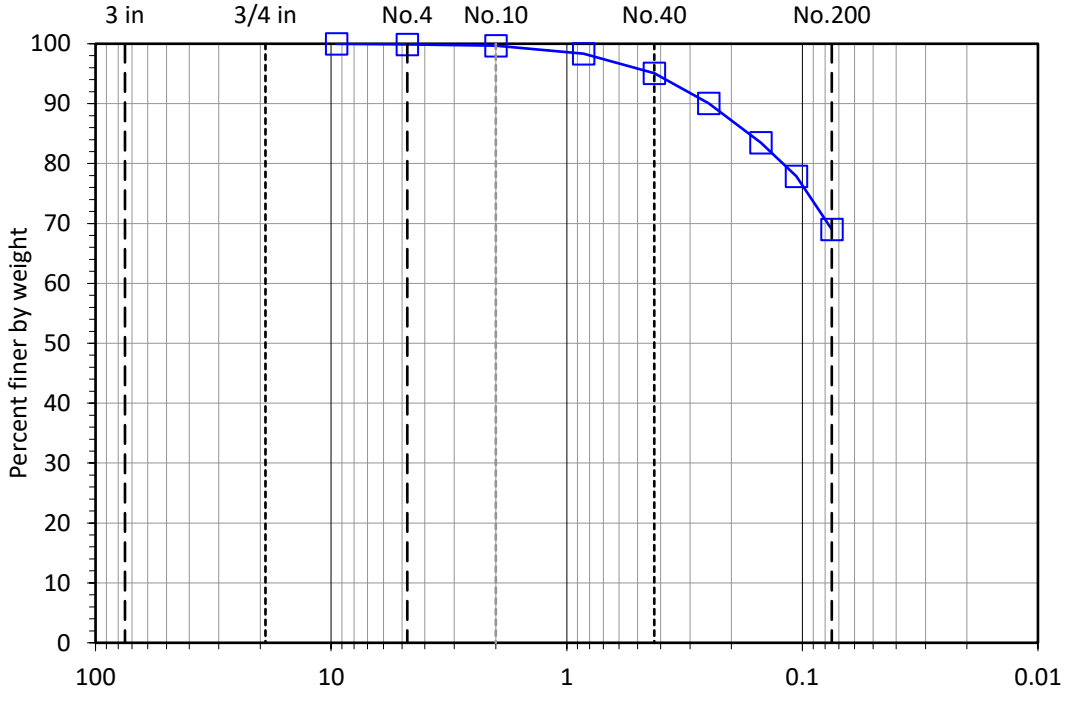
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/2/2024
By: CJ

Boring No.: TP-30
Station: 12
Depth: 8.5'
Description: Reddish brown sandy clay

Split:	No	
	Moist	Dry
Total sample wt. (g):	258.23	227.72
	-	
Split fraction:	1.000	

Water content data		
Moist soil + tare (g):	-	385.37
Dry soil + tare (g):	-	354.86
Tare (g):	-	127.14
Water content (%):	0.0	13.4

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
1"	-	25	-
3/4"	-	19	-
3/8"	-	9.5	100.0
No.4	0.25	4.75	99.9
No.10	0.76	2	99.7
No.20	3.73	0.85	98.4
No.40	11.22	0.425	95.1
No.60	22.57	0.25	90.1
No.100	37.56	0.15	83.5
No.140	50.35	0.106	77.9
No.200	70.56	0.075	69.0



Gravel (%): 0.1
Sand (%): 30.9
Fines (%): 69.0

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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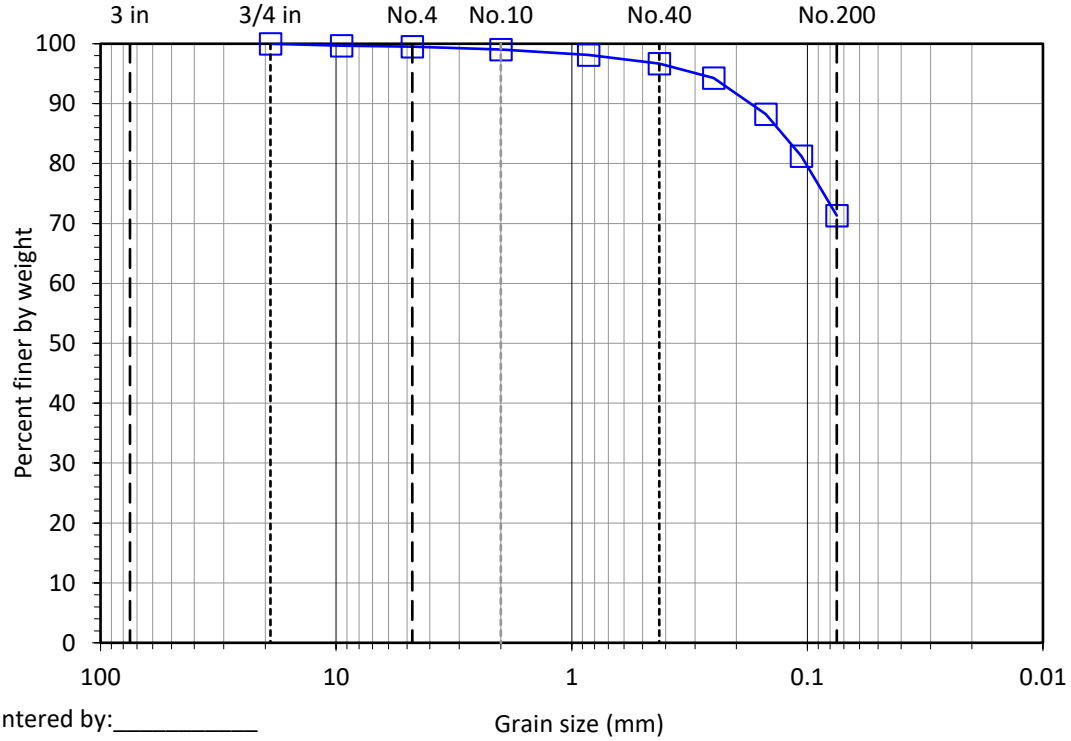
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 7/31/2024
By: SE

Boring No.: TP-27
Station: 19
Depth: 7.5'
Description: Red clay with sand

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	3403.87	2960.31
+3/8" Coarse fraction (g):	9.18	8.88
-3/8" Split fraction (g):	277.16	240.97
Split fraction:	0.997	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	134.64	489.09
Dry soil + tare (g):	134.31	452.90
Tare (g):	124.51	211.93
Water content (%):	3.4	15.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	-	
1"	-	25	-	
3/4"	-	19	100.0	
3/8"	8.88	9.5	99.7	←Split
No.4	0.39	4.75	99.5	
No.10	1.62	2	99.0	
No.20	3.75	0.85	98.1	
No.40	7.23	0.425	96.7	
No.60	13.09	0.25	94.3	
No.100	27.74	0.15	88.2	
No.140	44.64	0.106	81.2	
No.200	68.59	0.075	71.3	



Gravel (%): 0.5
Sand (%): 28.2
Fines (%): 71.3

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(In general accordance with ASTM D6913)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: JJ

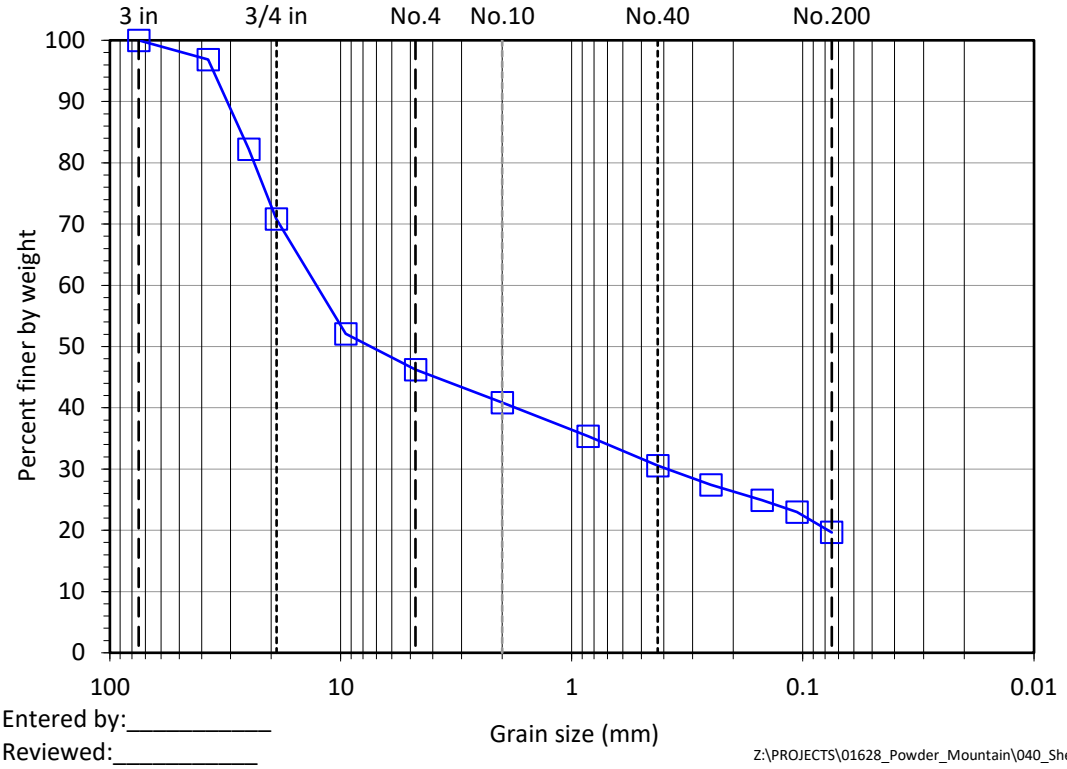
Boring No.: TP-25
Station: 8
Depth: 6.5'
Description: Red silty, clayey gravel with sand

Split:	Yes	
First Split sieve:	3/4"	
	Moist	Dry
Total sample wt. (g):	47271.1	45229.0
+3/4" Coarse fraction (g):	13320.6	13183.8
-3/4" Split fraction (g):	1359.8	1283.5
-3/8" Split fraction (g):	185.59	185.59
First Split fraction:	0.709	

Water content data	C.F.1(+3/4")	S.F.1(-3/4")	C.F.2(+3/8")	S.F.2(-3/8")
Moist soil + tare (g):	2942.46	1581.69	561.95	397.69
Dry soil + tare (g):	2915.47	1505.38	561.95	397.69
Tare (g):	314.97	221.92	221.96	212.10
Water content (%):	1.04	5.95	0.00	0.00

Second Split Data	
Second split:	Yes
Second split sieve:	3/8"
Second Split fraction:	0.521

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	100.0	
1.5"	1410.8	37.5	96.9	
1"	8026.3	25	82.3	
3/4"	13183.8	19	70.9	<=1st Split
3/8"	339.99	9.5	52.1	<=2nd Split
No.4	20.83	4.75	46.2	
No.10	40.09	2	40.8	
No.20	59.53	0.85	35.4	
No.40	76.74	0.425	30.5	
No.60	87.82	0.25	27.4	
No.100	96.71	0.15	24.9	
No.140	103.67	0.106	23.0	
No.200	115.48	0.075	19.7	



Gravel (%): 53.8
Sand (%): 26.6
Fines (%): 19.7

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(In general accordance with ASTM D6913)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 7/31/2024
By: KC

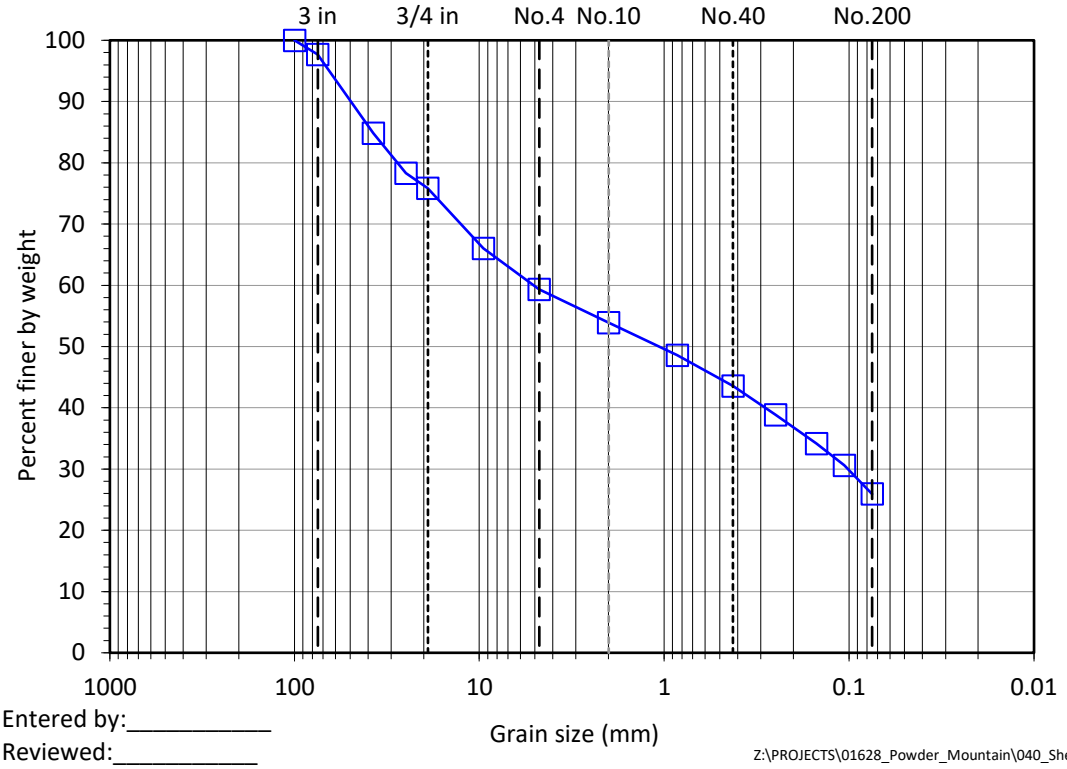
Boring No.: TP-23
Station: 22
Depth: 2.5'
Description: Reddish brown clayey gravel with sand

Split:	Yes	
First Split sieve:	3/4"	
	Moist	Dry
Total sample wt. (g):	28580.5	25570.0
+3/4" Coarse fraction (g):	6763.9	6178.2
-3/4" Split fraction (g):	2316.6	2059.1
-3/8" Split fraction (g):	221.59	221.59
First Split fraction:	0.758	

Water content data	C.F.1(+3/4")	S.F.1(-3/4")	C.F.2(+3/8")	S.F.2(-3/8")
Moist soil + tare (g):	2872.18	2627.07	575.90	349.03
Dry soil + tare (g):	2662.16	2369.58	575.90	349.03
Tare (g):	446.64	310.44	310.44	127.44
Water content (%):	9.48	12.50	0.00	0.00

Second Split Data	
Second split:	Yes
Second split sieve:	3/8"
Second Split fraction:	0.661

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	583.0	75	97.7	
1.5"	3872.5	37.5	84.9	
1"	5538.0	25	78.3	
3/4"	6178.2	19	75.8	<=1st Split
3/8"	265.46	9.5	66.1	<=2nd Split
No.4	22.43	4.75	59.4	
No.10	40.74	2	53.9	
No.20	58.59	0.85	48.6	
No.40	75.39	0.425	43.6	
No.60	91.22	0.25	38.9	
No.100	106.98	0.15	34.2	
No.140	118.87	0.106	30.6	
No.200	134.53	0.075	26.0	



Gravel (%): 40.6
Sand (%): 33.4
Fines (%): 26.0

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

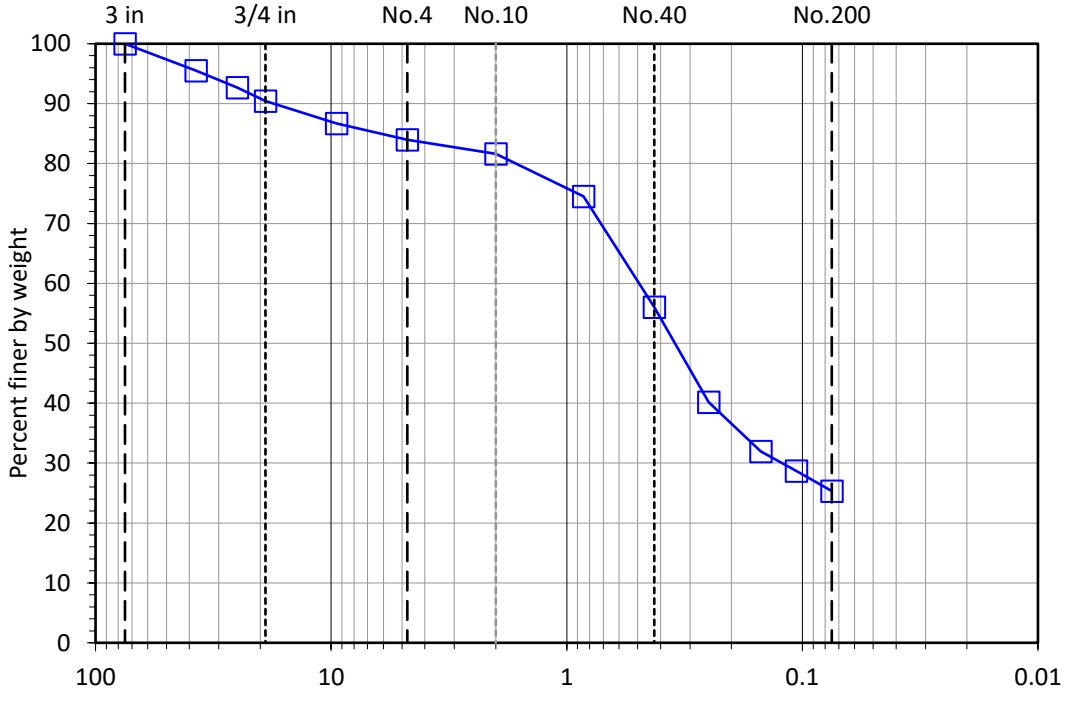
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/5/2024
By: SE

Boring No.: TP-22
Station: 7
Depth: 7.0'
Description: Red clayey sand with gravel

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	26969.8	24692.3
+3/8" Coarse fraction (g):	3389.4	3284.2
-3/8" Split fraction (g):	278.75	253.07
Split fraction:	0.867	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	2085.94	405.60
Dry soil + tare (g):	2035.64	379.92
Tare (g):	465.05	126.85
Water content (%):	3.2	10.1

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	100.0	
1.5"	1102.8	37.5	95.5	
1"	1811.3	25	92.7	
3/4"	2361.3	19	90.4	
3/8"	3284.2	9.5	86.7	←Split
No.4	7.97	4.75	84.0	
No.10	14.88	2	81.6	
No.20	35.56	0.85	74.5	
No.40	89.53	0.425	56.0	
No.60	135.80	0.25	40.2	
No.100	159.81	0.15	31.9	
No.140	169.41	0.106	28.7	
No.200	179.11	0.075	25.3	



Gravel (%): 16.0
Sand (%): 58.6
Fines (%): 25.3

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

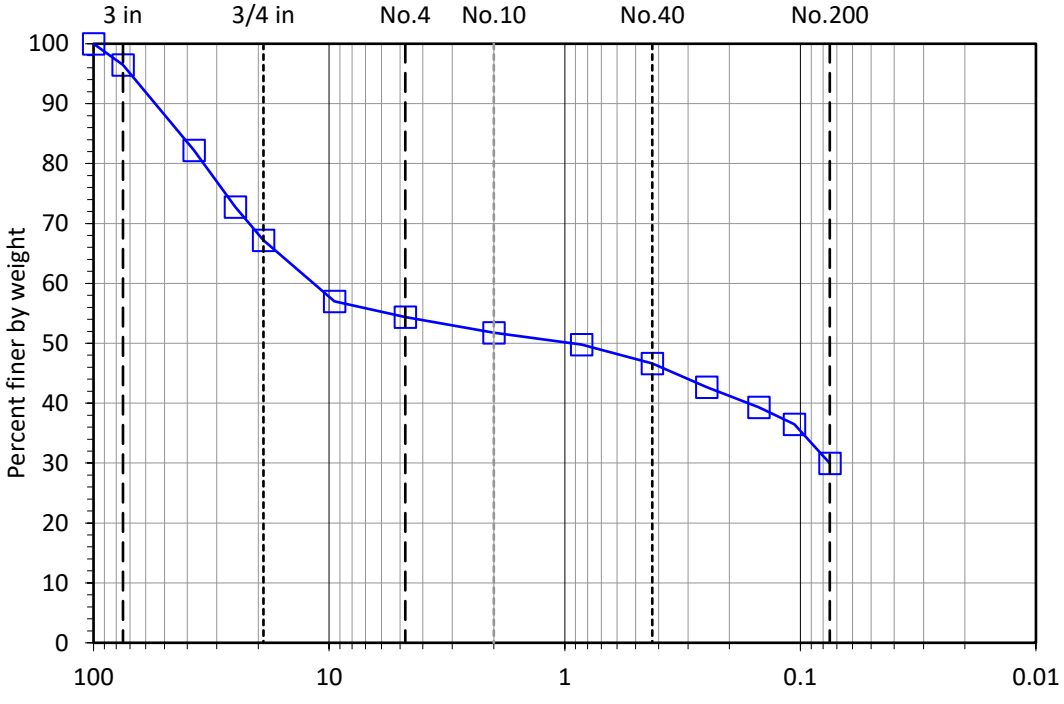
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-16
Station: 11
Depth: 5.5'
Description: Red silty, clayey gravel with sand

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	24445.8	22364.2
+3/8" Coarse fraction (g):	10043.6	9616.2
-3/8" Split fraction (g):	289.93	256.63
Split fraction:	0.570	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1811.98	412.99
Dry soil + tare (g):	1749.01	379.69
Tare (g):	332.22	123.06
Water content (%):	4.4	13.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	783.6	75	96.5	
1.5"	3977.0	37.5	82.2	
1"	6090.6	25	72.8	
3/4"	7337.9	19	67.2	
3/8"	9616.2	9.5	57.0	←Split
No.4	11.90	4.75	54.4	
No.10	23.70	2	51.7	
No.20	32.44	0.85	49.8	
No.40	46.75	0.425	46.6	
No.60	64.38	0.25	42.7	
No.100	79.65	0.15	39.3	
No.140	92.28	0.106	36.5	
No.200	121.72	0.075	30.0	



Gravel (%): 45.6
Sand (%): 24.4
Fines (%): 30.0

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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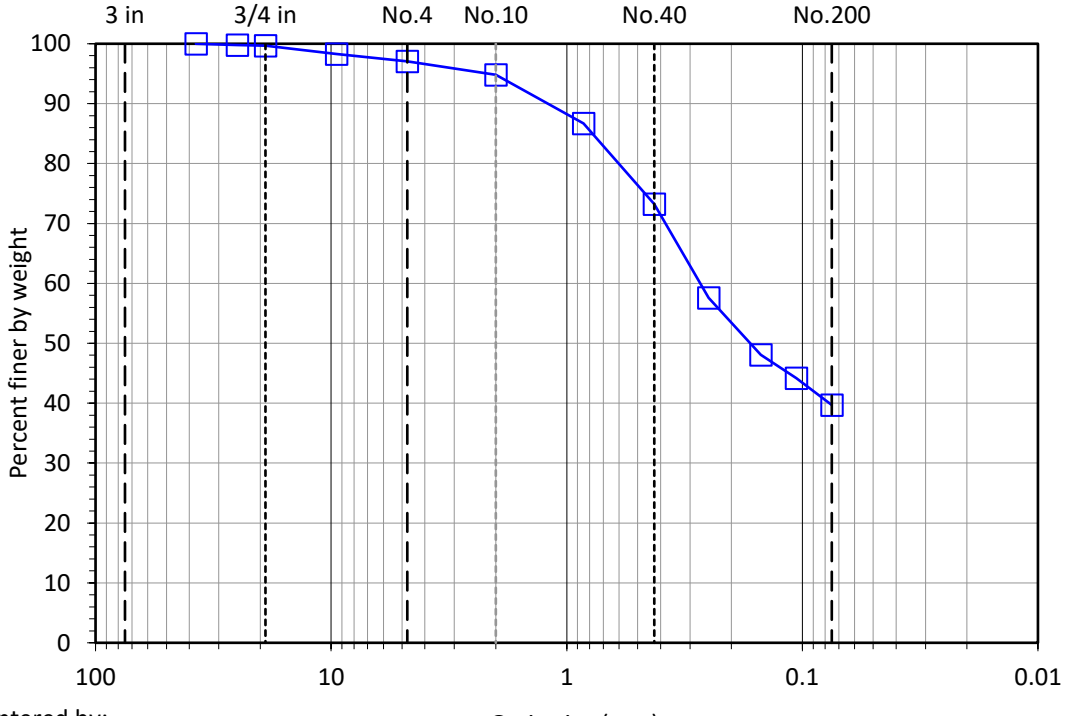
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: KC

Boring No.: TP-14
Station: 18
Depth: 4.5'
Description: Light brown clayey sand

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	23991.9	22645.4
+3/8" Coarse fraction (g):	395.18	391.98
-3/8" Split fraction (g):	309.00	291.41
Split fraction:	0.983	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	534.99	437.41
Dry soil + tare (g):	531.79	419.82
Tare (g):	139.87	128.41
Water content (%):	0.8	6.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	49.92	25	99.8	
3/4"	72.95	19	99.7	
3/8"	391.98	9.5	98.3	←Split
No.4	3.53	4.75	97.1	
No.10	10.22	2	94.8	
No.20	34.27	0.85	86.7	
No.40	74.24	0.425	73.2	
No.60	120.66	0.25	57.6	
No.100	148.84	0.15	48.1	
No.140	160.38	0.106	44.2	
No.200	173.70	0.075	39.7	



Gravel (%): 2.9
Sand (%): 57.4
Fines (%): 39.7

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

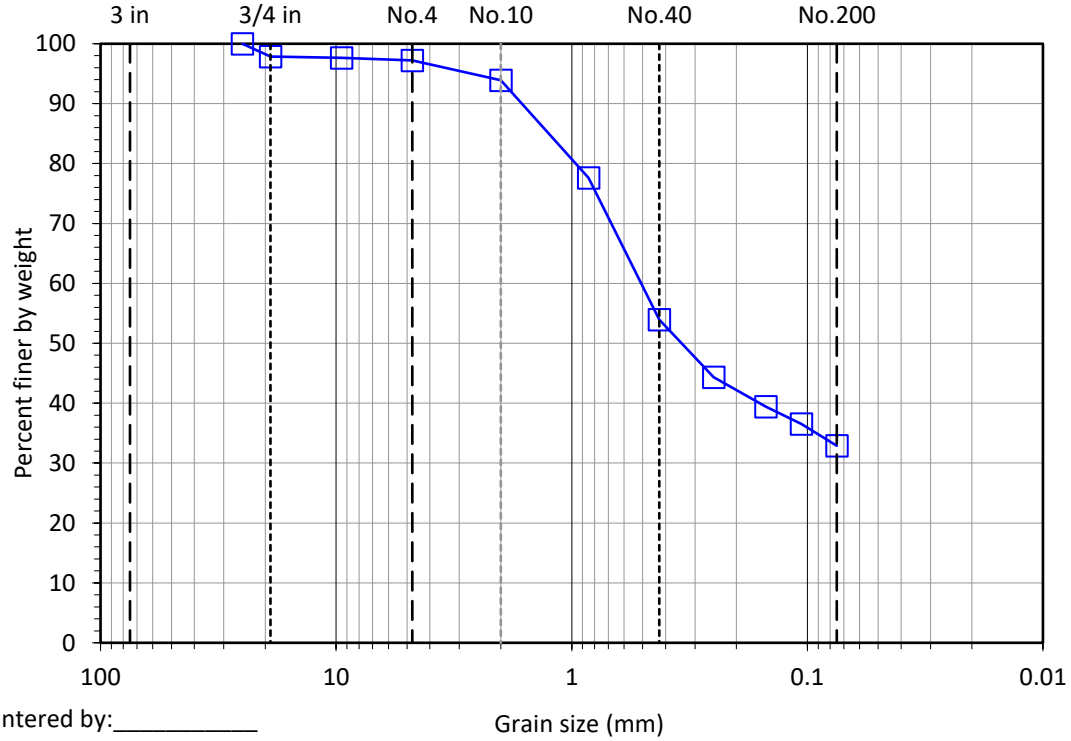
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/2/2024
By: CJ

Boring No.: TP-12
Station: 15.5
Depth: 2.5'
Description: Reddish brown clayey sand

Split:	Yes	
Split sieve:	3/8"	
	Moist	Dry
Total sample wt. (g):	1150.41	1035.57
+3/8" Coarse fraction (g):	28.38	24.28
-3/8" Split fraction (g):	275.78	248.56
Split fraction:	0.977	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	224.83	403.35
Dry soil + tare (g):	220.60	376.13
Tare (g):	195.52	127.57
Water content (%):	16.9	11.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	-	
1"	-	25	100.0	
3/4"	22.22	19	97.9	
3/8"	24.28	9.5	97.7	←Split
No.4	1.04	4.75	97.2	
No.10	9.49	2	93.9	
No.20	51.00	0.85	77.6	
No.40	111.24	0.425	54.0	
No.60	135.75	0.25	44.3	
No.100	148.22	0.15	39.4	
No.140	155.58	0.106	36.5	
No.200	164.84	0.075	32.9	



Gravel (%): 2.8
Sand (%): 64.4
Fines (%): 32.9

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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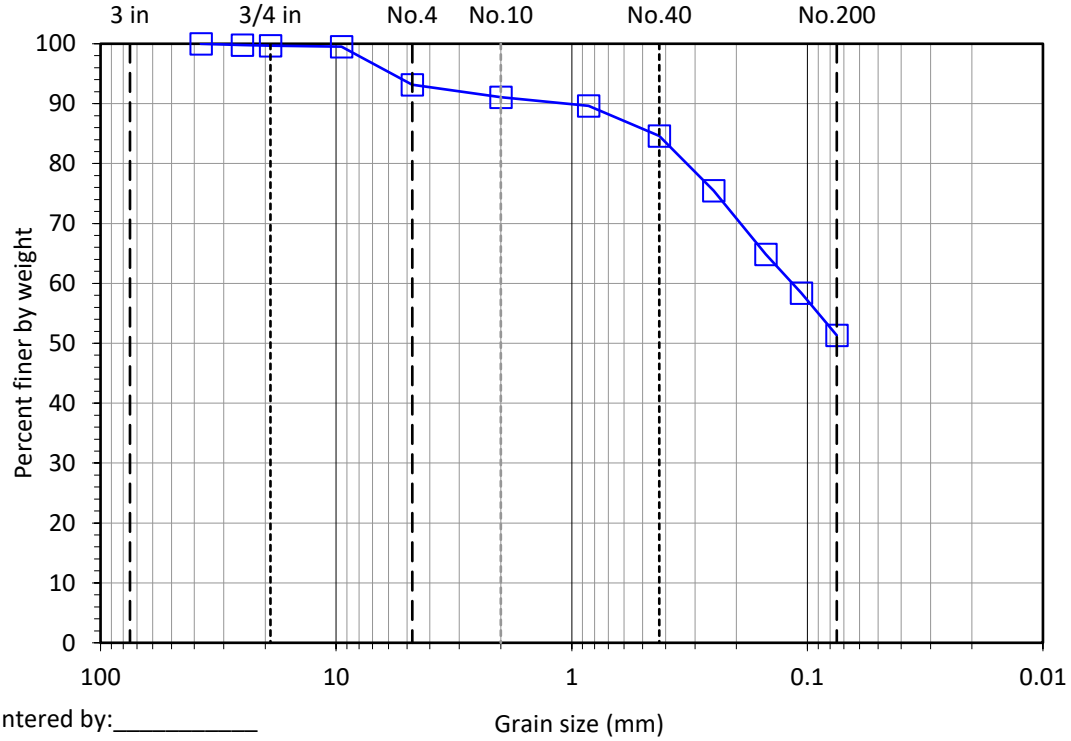
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-9
Station: 24
Depth: 9.0'
Description: Reddish brown sandy clay

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	26274.2	23807.4
+3/8" Coarse fraction (g):	110.97	109.51
-3/8" Split fraction (g):	295.77	267.90
Split fraction:	0.995	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	232.85	418.75
Dry soil + tare (g):	231.39	390.88
Tare (g):	121.88	122.98
Water content (%):	1.3	10.4

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	49.50	25	99.8	
3/4"	73.79	19	99.7	
3/8"	109.51	9.5	99.5	←Split
No.4	17.11	4.75	93.2	
No.10	22.76	2	91.1	
No.20	26.65	0.85	89.6	
No.40	40.16	0.425	84.6	
No.60	64.75	0.25	75.5	
No.100	93.31	0.15	64.9	
No.140	110.80	0.106	58.4	
No.200	129.79	0.075	51.3	



Gravel (%): 6.8
Sand (%): 41.9
Fines (%): 51.3

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: CJ

Boring No.: TP-7
Station: 7
Depth: 4.5'
Description: Reddish brown clayey sand

Split: No

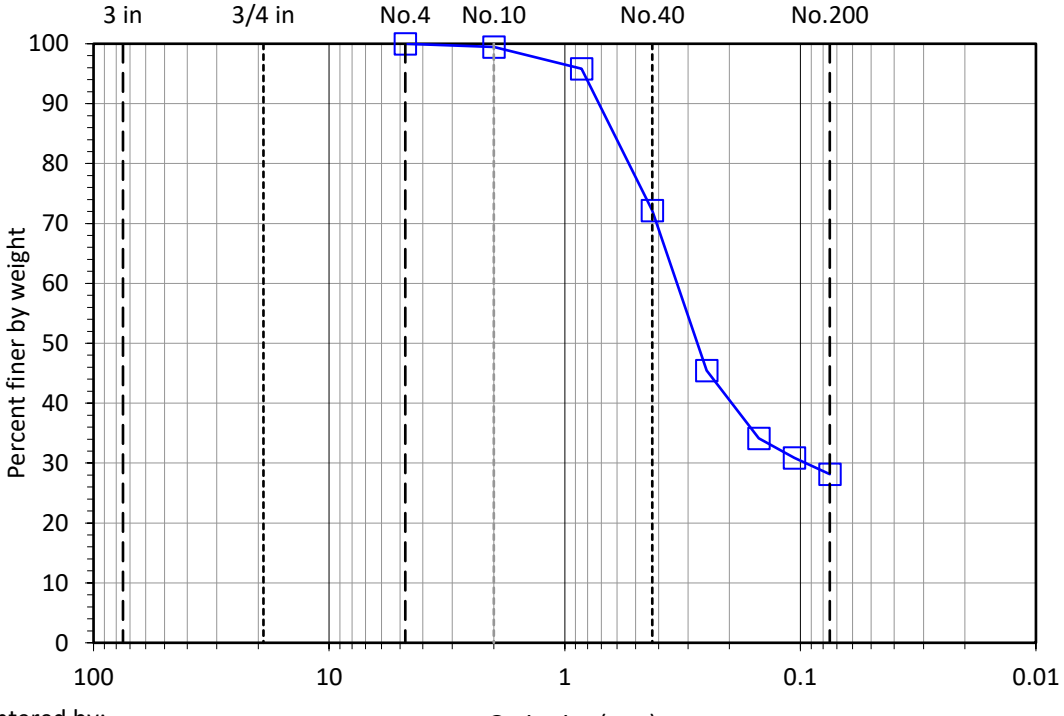
	Moist	Dry
Total sample wt. (g):	228.82	201.49
	-	

Split fraction: 1.000

Water content data

Moist soil + tare (g):	-	350.25
Dry soil + tare (g):	-	322.92
Tare (g):	-	121.43
Water content (%):	0.0	13.6

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer
6"	-	150	-
4"	-	100	-
3"	-	75	-
1.5"	-	37.5	-
1"	-	25	-
3/4"	-	19	-
3/8"	-	9.5	-
No.4	-	4.75	100.0
No.10	1.04	2	99.5
No.20	8.36	0.85	95.9
No.40	56.08	0.425	72.2
No.60	109.86	0.25	45.5
No.100	132.67	0.15	34.2
No.140	139.33	0.106	30.9
No.200	144.78	0.075	28.1



Gravel (%): 0.0
Sand (%): 71.9
Fines (%): 28.1

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

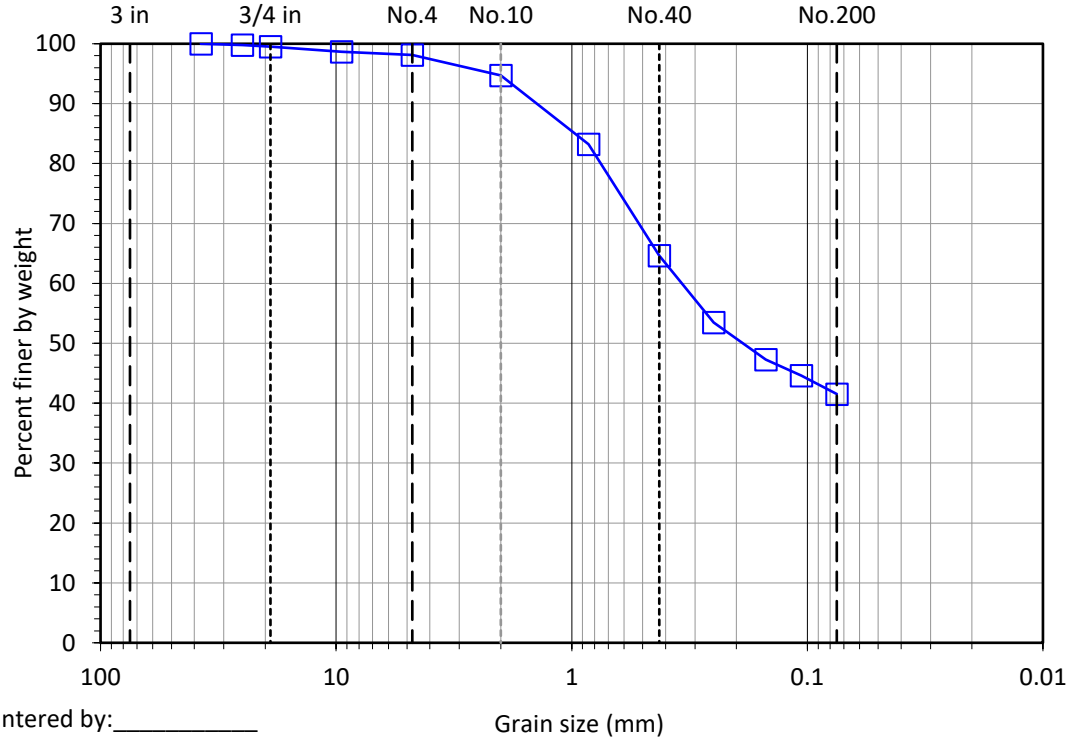
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-6
Station: 8
Depth: 5.5'
Description: Red clayey sand

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	24943.2	23111.9
+3/8" Coarse fraction (g):	316.25	309.07
-3/8" Split fraction (g):	282.98	262.02
Split fraction:	0.987	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	494.18	403.77
Dry soil + tare (g):	487.00	382.81
Tare (g):	177.93	120.79
Water content (%):	2.3	8.0

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	51.94	25	99.8	
3/4"	110.24	19	99.5	
3/8"	309.07	9.5	98.7	←Split
No.4	1.46	4.75	98.1	
No.10	10.46	2	94.7	
No.20	40.99	0.85	83.2	
No.40	90.41	0.425	64.6	
No.60	120.01	0.25	53.5	
No.100	136.40	0.15	47.3	
No.140	143.59	0.106	44.6	
No.200	151.73	0.075	41.5	



Gravel (%): 1.9
Sand (%): 56.6
Fines (%): 41.5

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(In general accordance with ASTM D6913)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: KC

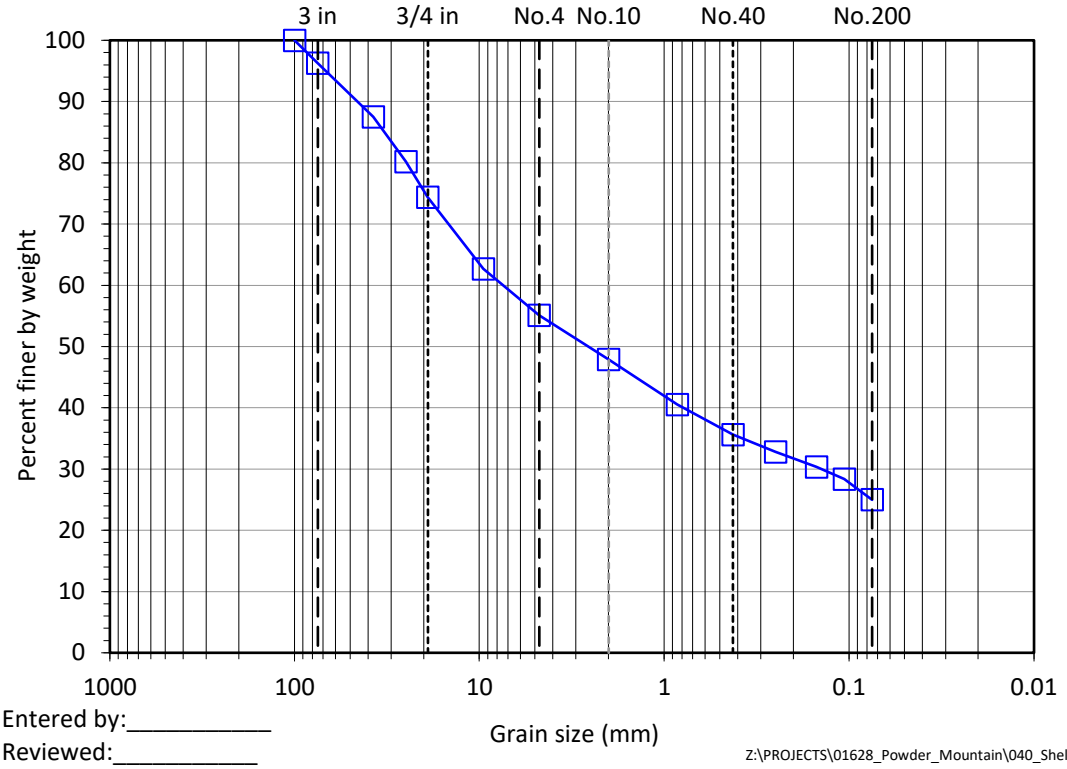
Boring No.: TP-5
Station: 11
Depth: 4.5'
Description: Reddish brown clayey gravel with sand

	Moist	Dry
Split:	Yes	
First Split sieve:	3/4"	
Total sample wt. (g):	25225.4	23303.5
+3/4" Coarse fraction (g):	6026.3	5964.8
-3/4" Split fraction (g):	2069.2	1868.7
-3/8" Split fraction (g):	200.05	200.05
First Split fraction:	0.744	

Water content data	C.F.1(+3/4")	S.F.1(-3/4")	C.F.2(+3/8")	S.F.2(-3/8")
Moist soil + tare (g):	2850.95	2515.80	740.23	408.41
Dry soil + tare (g):	2826.06	2315.29	740.23	408.41
Tare (g):	410.31	446.61	446.61	208.36
Water content (%):	1.03	10.73	0.00	0.00

Second Split Data	
Second split:	Yes
Second split sieve:	3/8"
Second Split fraction:	0.627

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	864.0	75	96.3	
1.5"	2914.4	37.5	87.5	
1"	4618.6	25	80.2	
3/4"	5964.8	19	74.4	<=1st Split
3/8"	293.62	9.5	62.7	<=2nd Split
No.4	24.28	4.75	55.1	
No.10	47.22	2	47.9	
No.20	70.79	0.85	40.5	
No.40	86.32	0.425	35.7	
No.60	95.35	0.25	32.8	
No.100	103.15	0.15	30.4	
No.140	109.60	0.106	28.4	
No.200	120.24	0.075	25.0	



Gravel (%): 44.9
Sand (%): 30.1
Fines (%): 25.0

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

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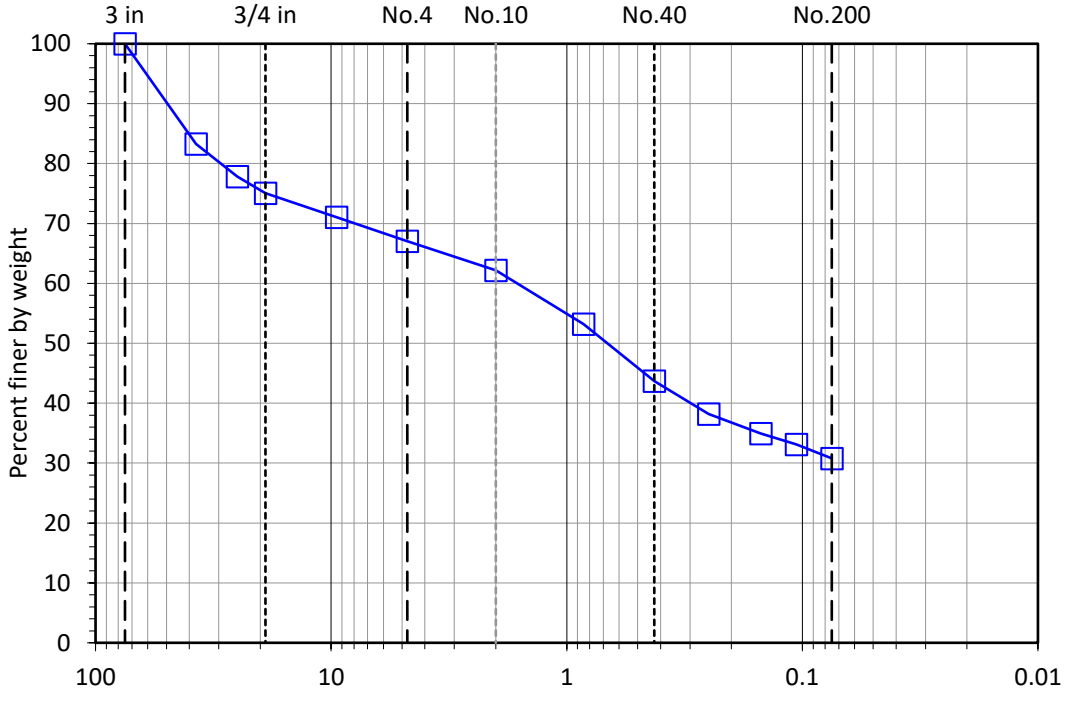
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/9/2024
By: RH

Boring No.: TP-4
Station: 12
Depth: 6.0'
Description: Red clayey sand with gravel

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	24818.5	23402.8
+3/8" Coarse fraction (g):	6873.7	6770.4
-3/8" Split fraction (g):	316.81	293.64
Split fraction:	0.711	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	1745.38	444.04
Dry soil + tare (g):	1723.86	420.87
Tare (g):	312.74	127.23
Water content (%):	1.5	7.9

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	100.0	
1.5"	3914.2	37.5	83.3	
1"	5185.2	25	77.8	
3/4"	5833.0	19	75.1	
3/8"	6770.4	9.5	71.1	←Split
No.4	16.65	4.75	67.0	
No.10	36.83	2	62.2	
No.20	73.86	0.85	53.2	
No.40	113.16	0.425	43.7	
No.60	135.79	0.25	38.2	
No.100	149.19	0.15	35.0	
No.140	156.88	0.106	33.1	
No.200	166.43	0.075	30.8	



Gravel (%): 33.0
Sand (%): 36.3
Fines (%): 30.8

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

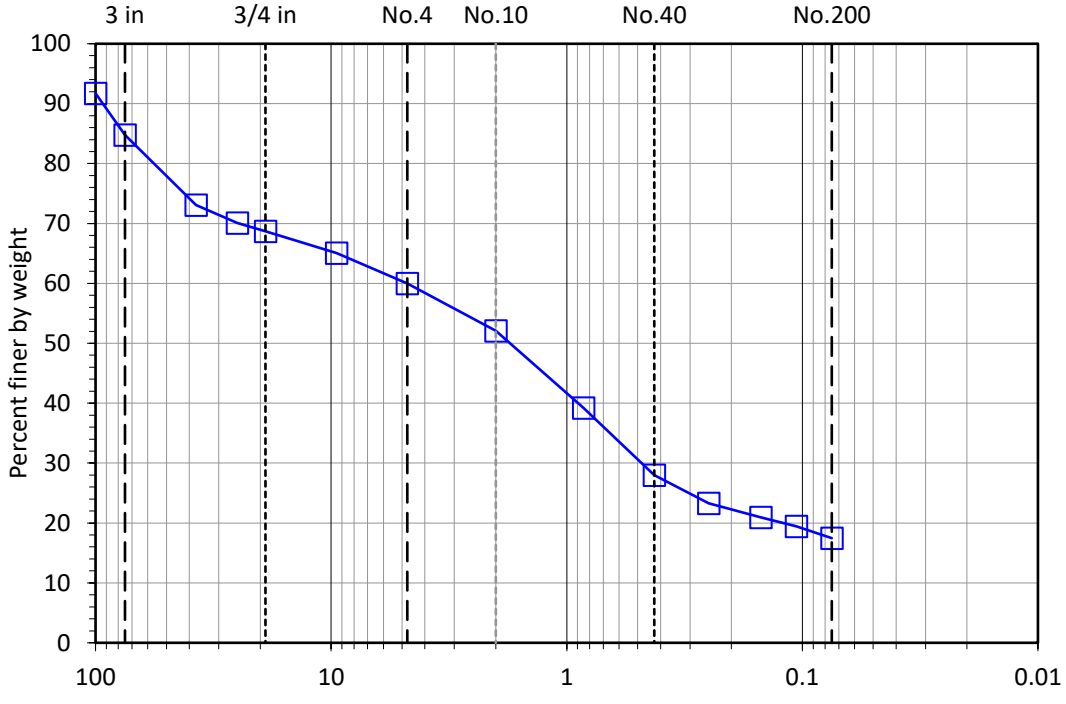
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-3
Station: 17
Depth: 4.0'
Description: Brownish red clayey sand with gravel

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	29190.5	28009.4
+3/8" Coarse fraction (g):	9879.9	9779.0
-3/8" Split fraction (g):	231.88	218.91
Split fraction:	0.651	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	2342.65	355.54
Dry soil + tare (g):	2322.89	342.57
Tare (g):	408.41	123.66
Water content (%):	1.0	5.9

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	100.0	
4"	2319.4	100	91.7	
3"	4259.8	75	84.8	
1.5"	7542.0	37.5	73.1	
1"	8384.8	25	70.1	
3/4"	8773.5	19	68.7	
3/8"	9779.0	9.5	65.1	←Split
No.4	17.06	4.75	60.0	
No.10	43.65	2	52.1	
No.20	87.07	0.85	39.2	
No.40	124.71	0.425	28.0	
No.60	140.61	0.25	23.3	
No.100	148.57	0.15	20.9	
No.140	153.54	0.106	19.4	
No.200	160.16	0.075	17.5	



Gravel (%): 40.0
Sand (%): 42.5
Fines (%): 17.5

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(In general accordance with ASTM D6913)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: KC

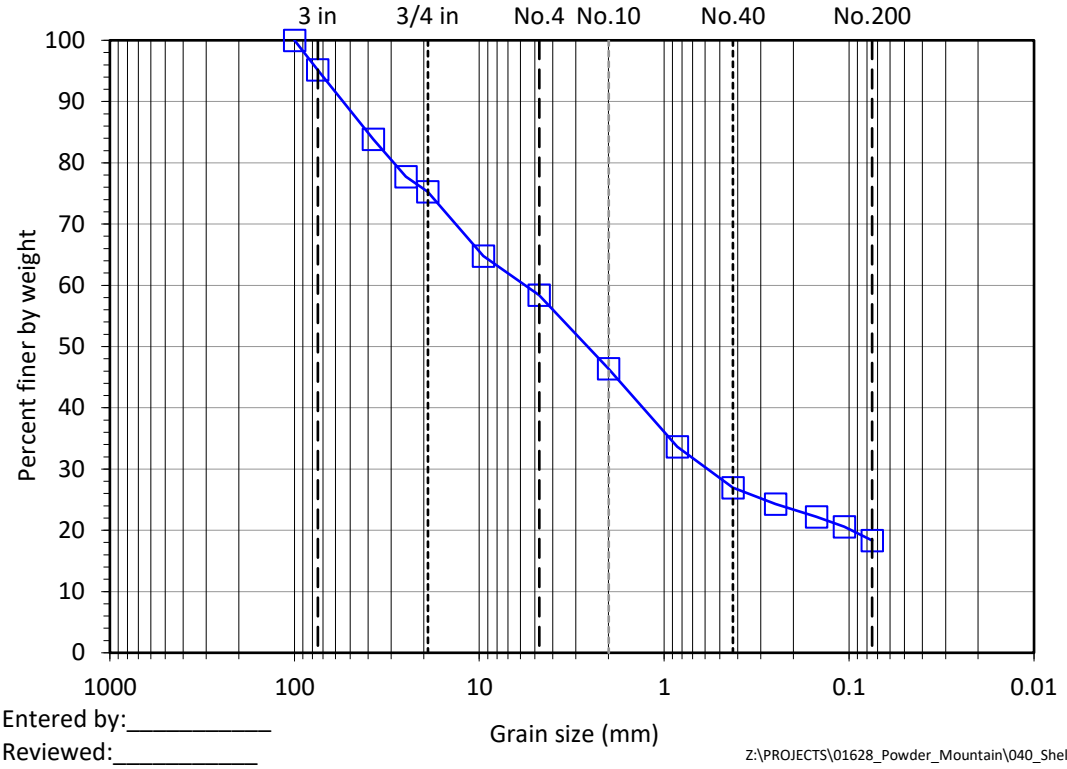
Boring No.: TP-2
Station: 10
Depth: 4.0'
Description: Reddish brown clayey gravel with sand

	Moist	Dry
Split:	Yes	
First Split sieve:	3/4"	
Total sample wt. (g):	56737.7	53136.1
+3/4" Coarse fraction (g):	13879.9	13118.9
-3/4" Split fraction (g):	2016.7	1883.0
-3/8" Split fraction (g):	211.52	211.52
First Split fraction:	0.753	

Water content data	C.F.1(+3/4")	S.F.1(-3/4")	C.F.2(+3/8")	S.F.2(-3/8")
Moist soil + tare (g):	2754.48	2347.34	593.33	338.17
Dry soil + tare (g):	2625.84	2213.67	593.33	338.17
Tare (g):	408.14	330.63	330.63	126.65
Water content (%):	5.80	7.10	0.00	0.00

Second Split Data	
Second split:	Yes
Second split sieve:	3/8"
Second Split fraction:	0.648

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	100.0	
3"	2551.2	75	95.2	
1.5"	8576.6	37.5	83.9	
1"	11815.5	25	77.8	
3/4"	13118.9	19	75.3	<=1st Split
3/8"	262.70	9.5	64.8	<=2nd Split
No.4	20.78	4.75	58.4	
No.10	60.14	2	46.4	
No.20	101.77	0.85	33.6	
No.40	123.51	0.425	27.0	
No.60	132.20	0.25	24.3	
No.100	138.96	0.15	22.2	
No.140	144.28	0.106	20.6	
No.200	151.58	0.075	18.4	



Gravel (%): 41.6
Sand (%): 40.1
Fines (%): 18.4

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

(ASTM D6913)

© IGES 2004, 2024

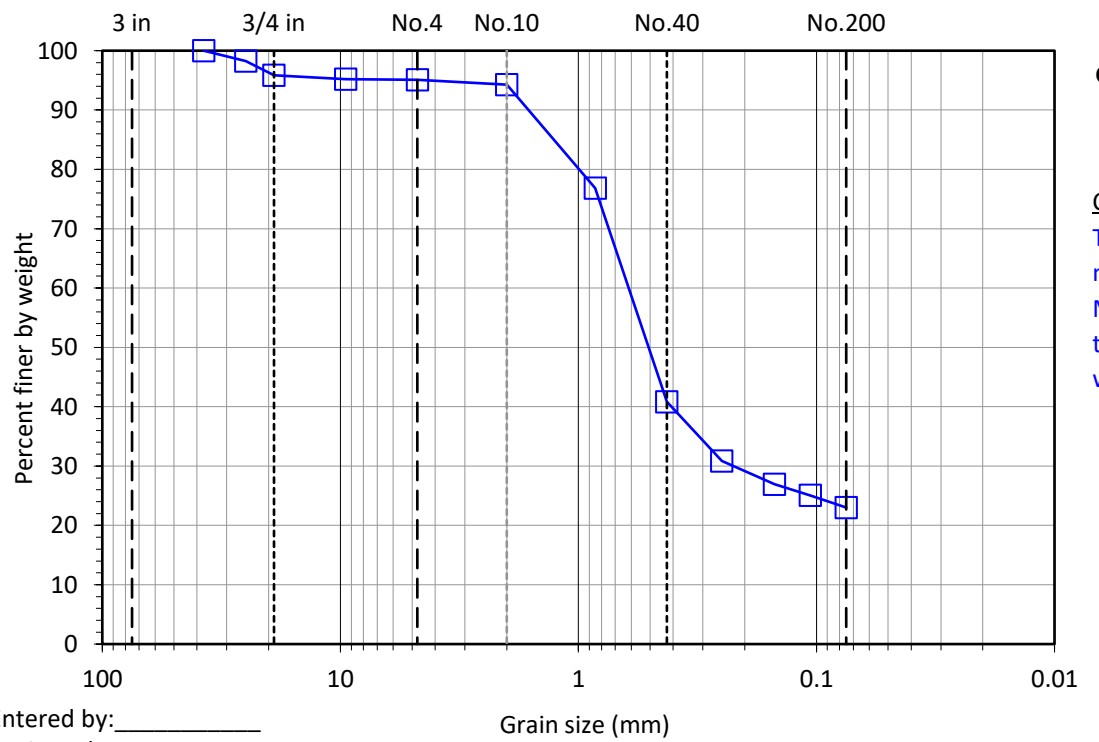
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/2/2024
By: LM

Boring No.: TP-1
Station: 19
Depth: 8.5'
Description: Red silty sand

	Moist	Dry
Split:	Yes	
Split sieve:	3/8"	
Total sample wt. (g):	4032.0	3657.6
+3/8" Coarse fraction (g):	184.03	174.79
-3/8" Split fraction (g):	240.36	217.55
Split fraction:	0.952	

Water content data	C.F.(+3/8")	S.F.(-3/8")
Moist soil + tare (g):	308.13	368.27
Dry soil + tare (g):	298.89	345.46
Tare (g):	124.09	127.91
Water content (%):	5.3	10.5

Sieve	Accum. Wt. Ret. (g)	Grain Size (mm)	Percent Finer	
6"	-	150	-	
4"	-	100	-	
3"	-	75	-	
1.5"	-	37.5	100.0	
1"	64.29	25	98.2	
3/4"	151.00	19	95.9	
3/8"	174.79	9.5	95.2	←Split
No.4	0.26	4.75	95.1	
No.10	2.16	2	94.3	
No.20	42.02	0.85	76.8	
No.40	124.32	0.425	40.8	
No.60	147.08	0.25	30.8	
No.100	156.03	0.15	26.9	
No.140	160.29	0.106	25.1	
No.200	164.98	0.075	23.0	



Gravel (%): 4.9
Sand (%): 72.1
Fines (%): 23.0

Comments:
These results are in nonconformance with Method D6913 because the minimum dry mass was not met.

Entered by:_____
Reviewed:_____

Amount of Material in Soil Finer than the No. 200 (75mm) Sieve

(ASTM D1140)

© IGES 2010, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: RH/CJ

Sample Info.	Boring No.	TP-31	TP-27	TP-26	TP-20	TP-18	TP-13	TP-11	TP-10
	Station	18	8	20	11	8	25	9.5	24
	Depth	7.5'	4.0'	5.0'	4.5'	5.0'	8.0'	9.0'	4.0'
	Split	No	No	No	Yes	No	No	No	No
	Split Sieve*				3/8"				
	Method	B	B	B	B	B	B	B	B
Specimen soak time (min)		450	450	330	510	480	320	210	190
Moist total sample wt. (g)		214.23	250.36	241.28	2721.00	243.17	232.06	224.05	219.00
Moist coarse fraction (g)					17.89				
Moist split fraction + tare (g)					373.04				
Split fraction tare (g)					153.21				
Dry split fraction (g)					183.80				
Dry retained No. 200 + tare (g)		257.16	179.76	294.26	193.52	313.31	184.84	154.44	142.90
Wash tare (g)		160.16	128.21	210.57	153.21	226.25	128.51	127.28	128.79
No. 200 Dry wt. retained (g)		97.00	51.55	83.69	40.31	87.06	56.33	27.16	14.11
Split sieve* Dry wt. retained (g)					17.73				
Dry total sample wt. (g)		189.81	206.60	207.96	2277.80	214.67	206.13	194.16	183.18
Coarse Fraction	Moist soil + tare (g)				40.38				
	Dry soil + tare (g)				40.22				
	Tare (g)				22.48				
	Water content (%)				0.90				
Split Fraction	Moist soil + tare (g)	374.39	378.57	451.85	373.04	469.42	360.57	351.33	347.79
	Dry soil + tare (g)	349.97	334.81	418.53	337.01	440.92	334.64	321.44	311.97
	Tare (g)	160.16	128.21	210.57	153.21	226.25	128.51	127.28	128.79
	Water content (%)	12.87	21.18	16.02	19.60	13.28	12.58	15.39	19.55
Percent passing split sieve* (%)					**99.2**				
Percent passing No. 200 sieve (%)		**48.9**	**75.0**	**59.8**	**77.5**	**59.4**	**72.7**	**86.0**	**92.3**

Entered by:_____

Reviewed:_____

Amount of Material in Soil Finer than the No. 200 (75mm) Sieve

(ASTM D1140)

© IGES 2010, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH/SE

Sample Info.	Boring No.	TP-8	TP-3						
	Station	21	14						
	Depth	3.0'	7.5'						
	Split	Yes	No						
	Split Sieve*	3/8"							
	Method	B	B						
Specimen soak time (min)		330	340						
Moist total sample wt. (g)		4274.29	222.03						
Moist coarse fraction (g)		363.84							
Moist split fraction + tare (g)		396.00							
Split fraction tare (g)		127.21							
Dry split fraction (g)		220.16							
Dry retained No. 200 + tare (g)		180.67	148.92						
Wash tare (g)		127.21	124.04						
No. 200 Dry wt. retained (g)		53.46	24.88						
Split sieve* Dry wt. retained (g)		358.07							
Dry total sample wt. (g)		3561.03	185.25						
Coarse Fraction	Moist soil + tare (g)	491.98							
	Dry soil + tare (g)	486.21							
	Tare (g)	128.14							
	Water content (%)	1.61							
Split Fraction	Moist soil + tare (g)	396.00	346.07						
	Dry soil + tare (g)	347.37	309.29						
	Tare (g)	127.21	124.04						
	Water content (%)	22.09	19.85						
Percent passing split sieve* (%)		**89.9**							
Percent passing No. 200 sieve (%)		**68.1**	**86.6**						

Comments: These results are in nonconformance with Method D1140 because the minimum dry mass was not met.

Entered by:_____

Reviewed:_____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/1/2024
By: JJ

Method: ASTM D1557 B
Mold Id. INC 1
Mold volume (ft^3): 0.0333

Boring No.: TP-31
Station: 15
Depth: 7.0'
Sample Description: Red clayey sand with gravel
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 25.2
Percent fraction passing, Pf (%) 74.8

Optimum water content (%): 12.3
Maximum dry unit weight (pcf): 124.7

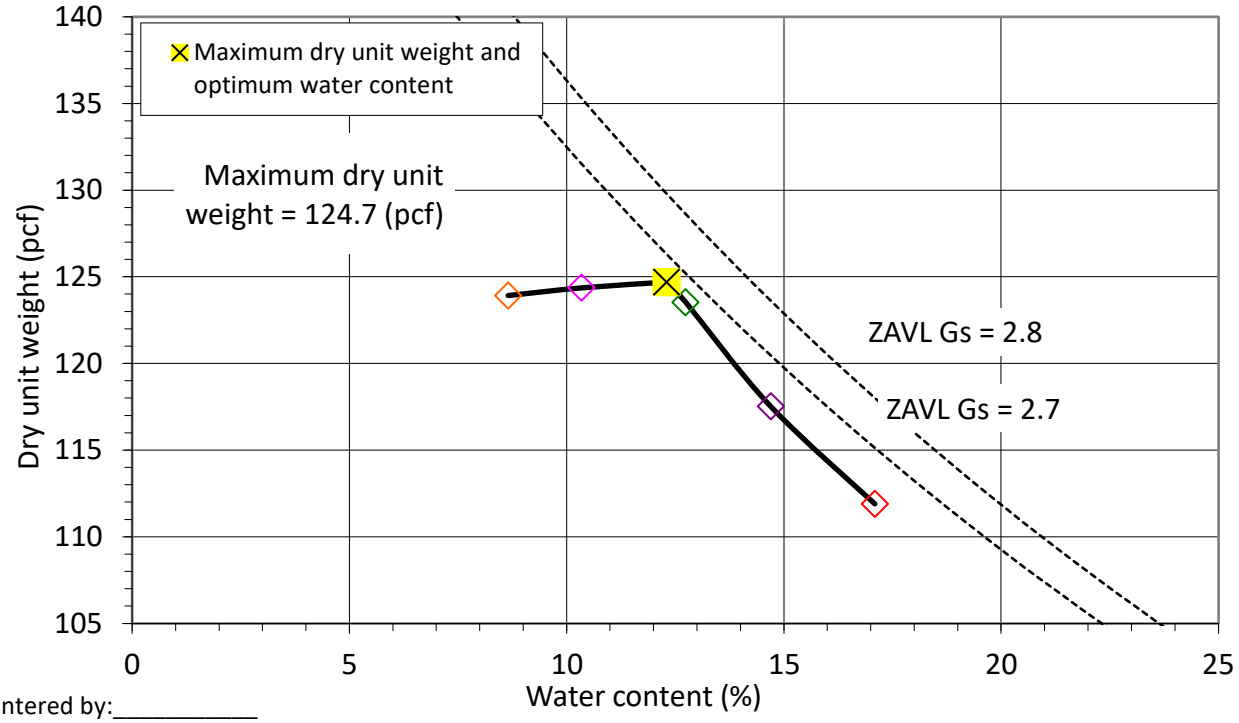
Point Number	+2%	+4%	As is	-2%	-4%			
Wt. Sample + Mold (g)	6251.0	6194.0	6318.5	6287.8	6248.6			
Wt. of Mold (g)	4214.9	4214.9	4214.9	4214.9	4214.9			
Total Unit Wt., γ (pcf)	134.8	131.0	139.3	137.2	134.6			
Wet Soil + Tare (g)	513.98	487.09	632.57	678.78	596.85			
Dry Soil + Tare (g)	463.93	434.74	575.56	627.21	559.42			
Tare (g)	123.40	128.45	127.95	128.65	126.86			
Water Content, w (%)	14.7	17.1	12.7	10.3	8.7			
Dry Unit Wt., γ_d (pcf)	117.5	111.9	123.5	124.4	123.9			

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 9.4
Corrected dry unit weight (pcf): 133.0

Oversized fraction, +3/8-in. (%): 25.2
Water content, +3/8-in. (%): 1.0
Sieve for oversized fraction: 3/8-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:_____

Reviewed:_____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

© IGES 2004, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/12/2024
By: JJ

Method: ASTM D1557 C
Mold Id. INC 6
Mold volume (ft^3): 0.0750

Boring No.: TP-25
Station: 8
Depth: 6.5'
Sample Description: Red silty, clayey gravel with sand
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-sector face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 29.1
Percent fraction passing, Pf (%) 70.9

Optimum water content (%): 8.2
Maximum dry unit weight (pcf): 128.4

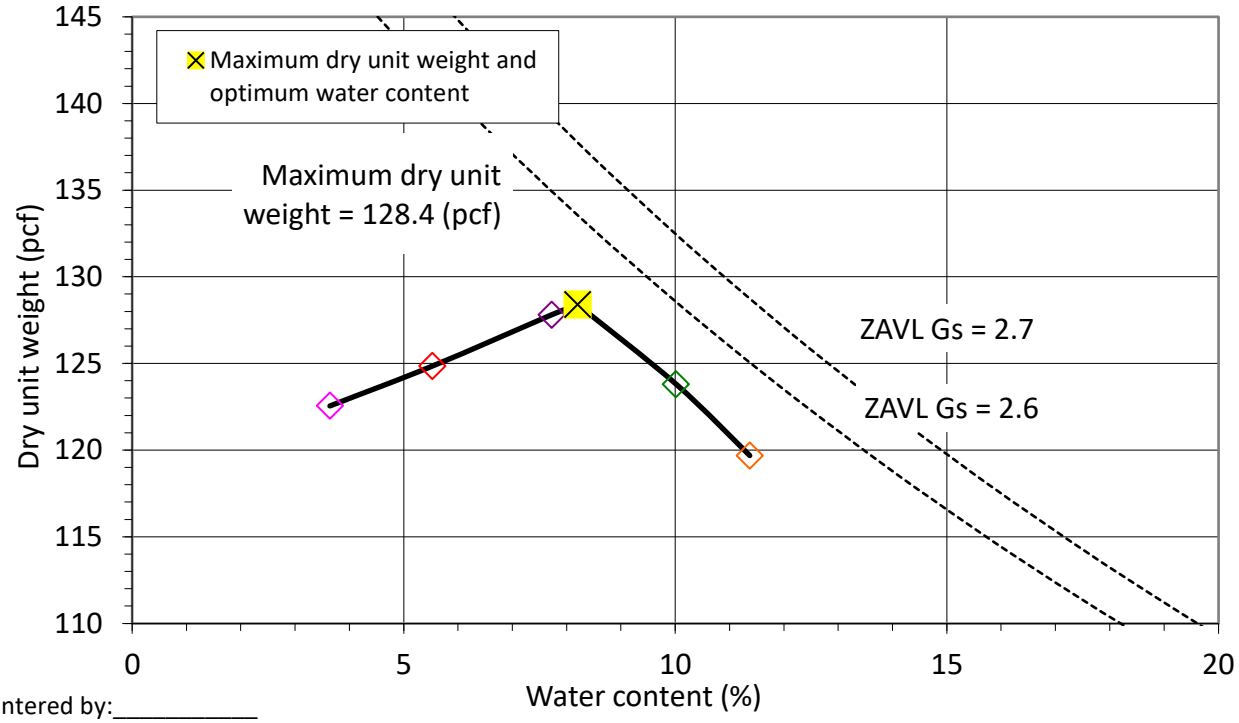
Point Number	+2%	As is	+4%	-2%	+6%			
Wt. Sample + Mold (g)	11118.3	10916.7	11067.9	10755.2	10968.9			
Wt. of Mold (g)	6433.9	6433.9	6433.9	6433.9	6433.9			
Total Unit Wt., γ (pcf)	137.7	131.8	136.2	127.0	133.3			
Wet Soil + Tare (g)	1282.67	1397.02	1491.42	1480.84	1126.39			
Dry Soil + Tare (g)	1220.01	1347.22	1384.08	1439.92	1044.72			
Tare (g)	408.72	446.42	312.09	315.74	326.51			
Water Content, w (%)	7.7	5.5	10.0	3.6	11.4			
Dry Unit Wt., γ_d (pcf)	127.8	124.9	123.8	122.6	119.7			

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 6.9
Corrected dry unit weight (pcf): 134.0

Oversized fraction, +3/4-in. (%): 18.7
Water content, +3/4-in. (%): 1.0
Sieve for oversized fraction: 3/4-in.
Bulk specific gravity, Gs: 2.65 Assumed



Entered by:_____

Reviewed:_____

Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 7/31/2024
By: KC

Method: ASTM D1557 C
Mold Id. INC 4
Mold volume (ft^3): 0.0750

Boring No.: TP-23
Station: 22
Depth: 2.5'
Sample Description: Reddish brown clayey gravel with sand
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-sector face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 24.2
Percent fraction passing, Pf (%) 75.8

Optimum water content (%): 9.3
Maximum dry unit weight (pcf): 126.2

Point Number	As is	*-2%	*-4%	*-6%				
Wt. Sample + Mold (g)	10155.0	10254.9	10112.0	9921.2				
Wt. of Mold (g)	5552.7	5552.7	5552.7	5552.7				
Total Unit Wt., γ (pcf)	135.2	138.2	134.0	128.4				
Wet Soil + Tare (g)	563.28	546.30	581.85	609.06				
Dry Soil + Tare (g)	515.89	509.36	549.41	588.43				
Tare (g)	126.37	127.45	128.57	214.99				
Water Content, w (%)	12.2	9.7	7.7	5.5				
Dry Unit Wt., γ_d (pcf)	120.6	126.0	124.4	121.7				

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

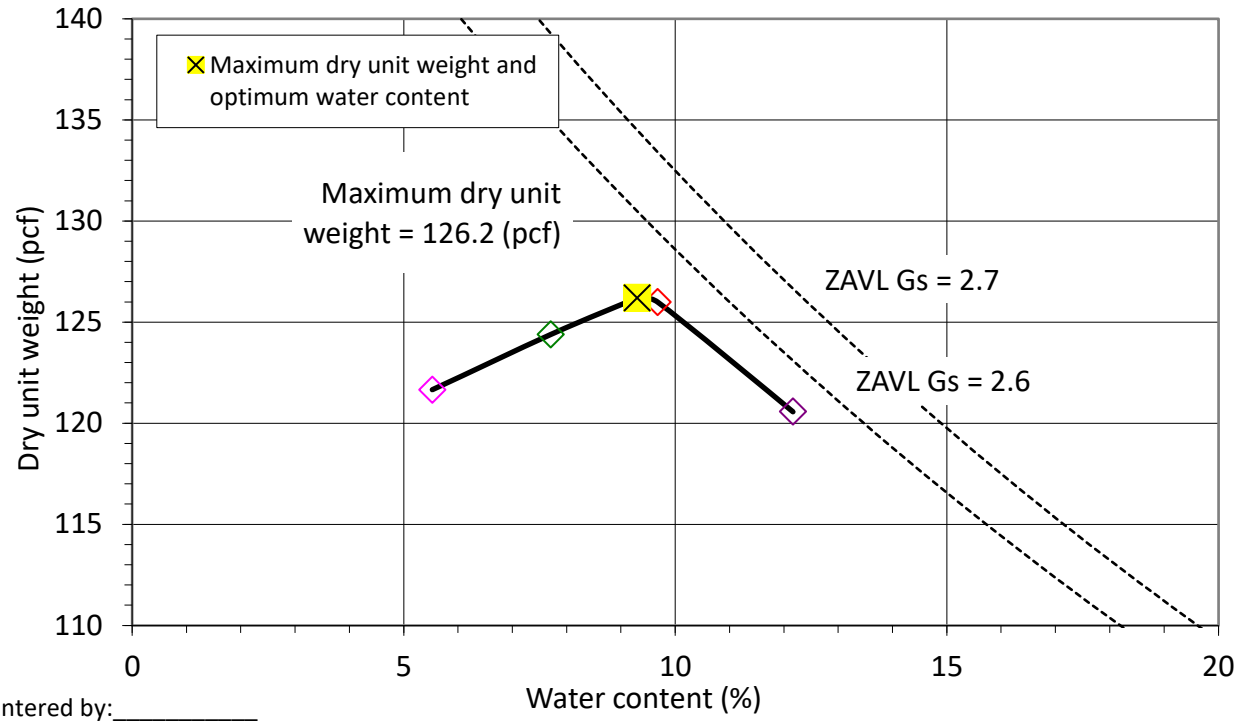
(ASTM D4718)

Corrected water content (%): 9.3
Corrected dry unit weight (pcf): 133.9

Oversized fraction, +3/4-in. (%): 24.2
Water content, +3/4-in. (%): 9.5
Sieve for oversized fraction: 3/4-in.
Bulk specific gravity, Gs: 2.65 Assumed

Comments:

*Previously compacted sample was used to create points -2%, -4%, and -6% due to insufficient material.



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Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/6/2024
By: KC

Method: ASTM D1557 B
Mold Id. IGES-8
Mold volume (ft^3): 0.0333

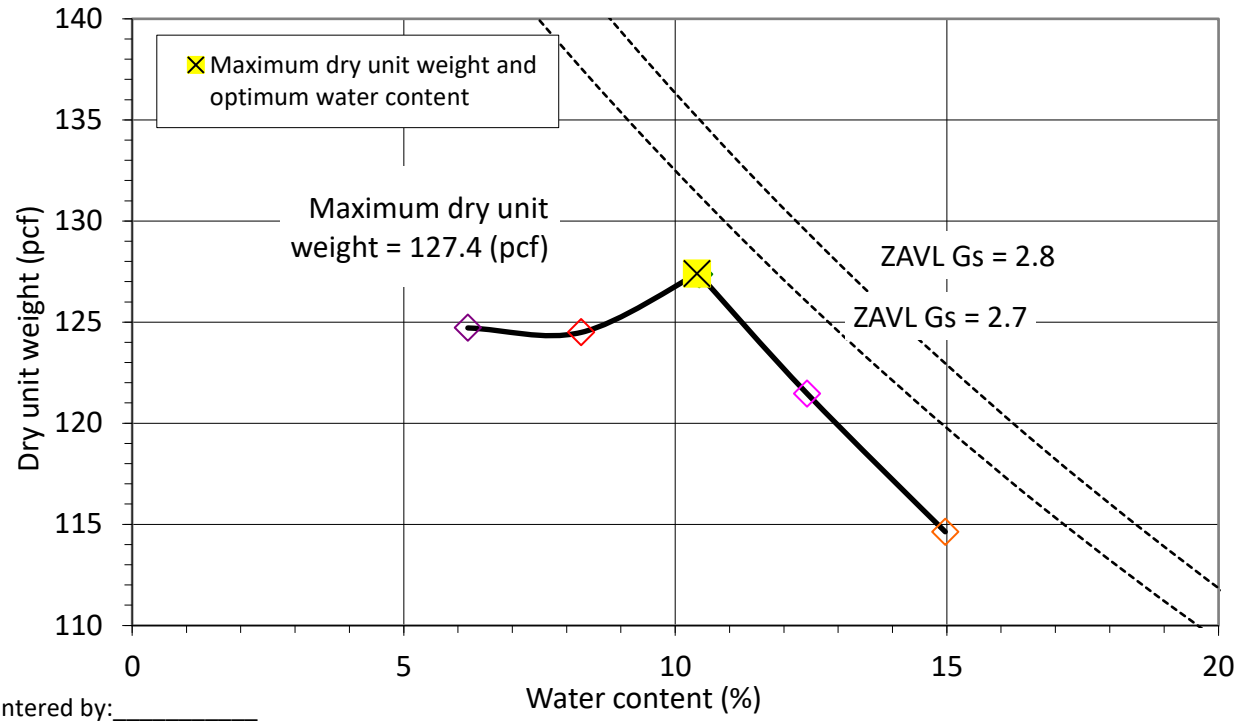
Boring No.: TP-14
Station: 18
Depth: 4.5'
Sample Description: Light brown clayey sand
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: No

Optimum water content (%): 10.4
Maximum dry unit weight (pcf): 127.4

Point Number	As is	+2%	+4%	+6%	*+8%			
Wt. Sample + Mold (g)	6127.8	6163.5	6252.2	6190.1	6118.2			
Wt. of Mold (g)	4127.5	4127.5	4127.5	4127.5	4127.5			
Total Unit Wt., γ (pcf)	132.4	134.8	140.7	136.6	131.8			
Wet Soil + Tare (g)	601.46	553.17	621.69	504.41	587.85			
Dry Soil + Tare (g)	573.57	520.63	574.98	462.32	527.15			
Tare (g)	122.19	126.97	127.50	123.62	121.72			
Water Content, w (%)	6.2	8.3	10.4	12.4	15.0			
Dry Unit Wt., γ_d (pcf)	124.7	124.5	127.4	121.5	114.6			

Comments:

*Previously compacted material was used to create point '+8%'



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Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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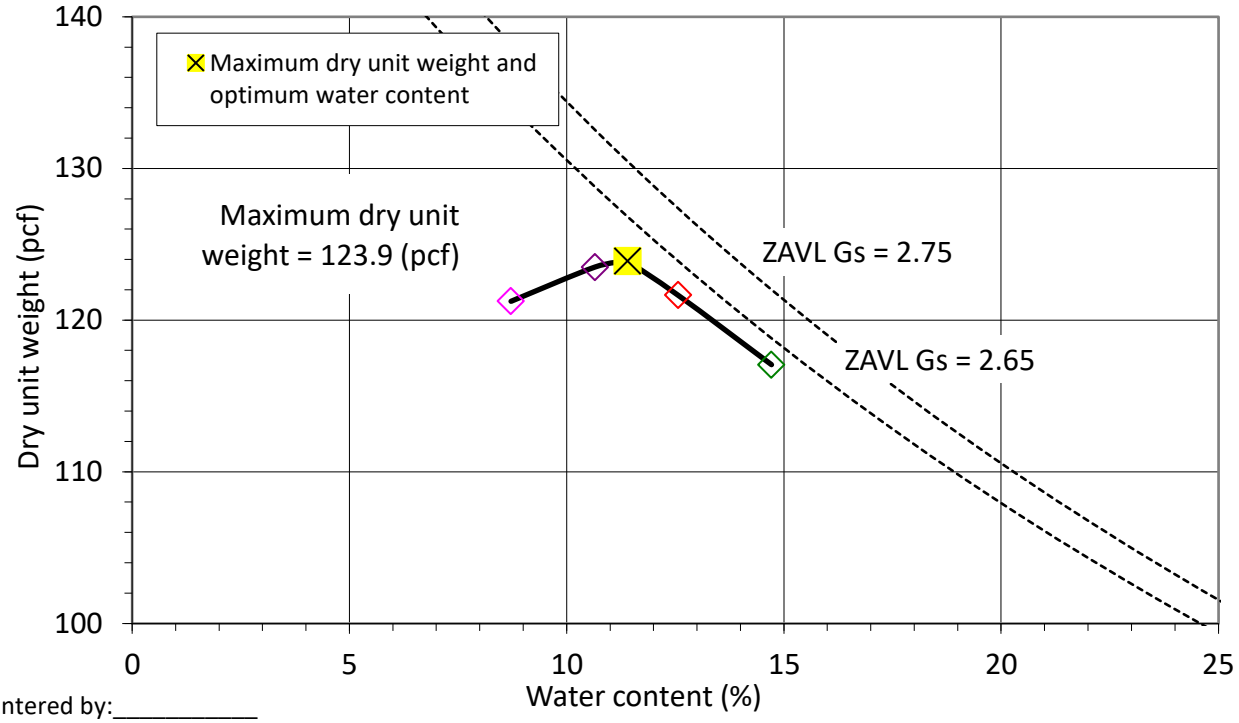
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Method: ASTM D1557 B
Mold Id. IGES-8
Mold volume (ft^3): 0.0333

Boring No.: TP-9
Station: 24
Depth: 9.0'
Sample Description: Reddish brown sandy clay
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-circular face
Rock Correction: No

Optimum water content (%): 11.4
Maximum dry unit weight (pcf): 123.9

Point Number	As Is	+2%	+4%	-2%				
Wt. Sample + Mold (g)	6191.5	6195.8	6155.7	6118.4				
Wt. of Mold (g)	4127.3	4127.3	4127.3	4127.3				
Total Unit Wt., γ (pcf)	136.7	136.9	134.3	131.8				
Wet Soil + Tare (g)	794.13	593.09	544.17	615.18				
Dry Soil + Tare (g)	739.51	540.76	490.76	575.81				
Tare (g)	226.58	124.18	127.71	124.13				
Water Content, w (%)	**10.6**	**12.6**	**14.7**	**8.7**				
Dry Unit Wt., γ_d (pcf)	**123.5**	**121.7**	**117.1**	**121.2**				



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Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/7/2024
By: KC

Method: ASTM D1557 C
Mold Id. INC 4
Mold volume (ft^3): 0.0750

Boring No.: TP-5
Station: 11
Depth: 4.5'
Sample Description: Reddish brown clayey gravel with sand
Engineering Classification: Not requested
As-received water content (%): Not requested
Preparation method: Moist
Rammer: Mechanical-sector face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 25.6
Percent fraction passing, Pf (%) 74.4

Optimum water content (%): 11.0
Maximum dry unit weight (pcf): 123.8

Point Number	As is	*+2%	-2%	*+4%				
Wt. Sample + Mold (g)	10204.2	10168.6	10101.0	10081.6				
Wt. of Mold (g)	5552.4	5552.4	5552.4	5552.4				
Total Unit Wt., γ (pcf)	136.7	135.7	133.7	133.1				
Wet Soil + Tare (g)	643.82	755.98	650.82	797.22				
Dry Soil + Tare (g)	594.11	685.88	607.44	713.47				
Tare (g)	122.32	128.55	127.42	126.91				
Water Content, w (%)	**10.5**	**12.6**	**9.0**	**14.3**				
Dry Unit Wt., γ_d (pcf)	**123.7**	**120.5**	**122.6**	**116.5**				

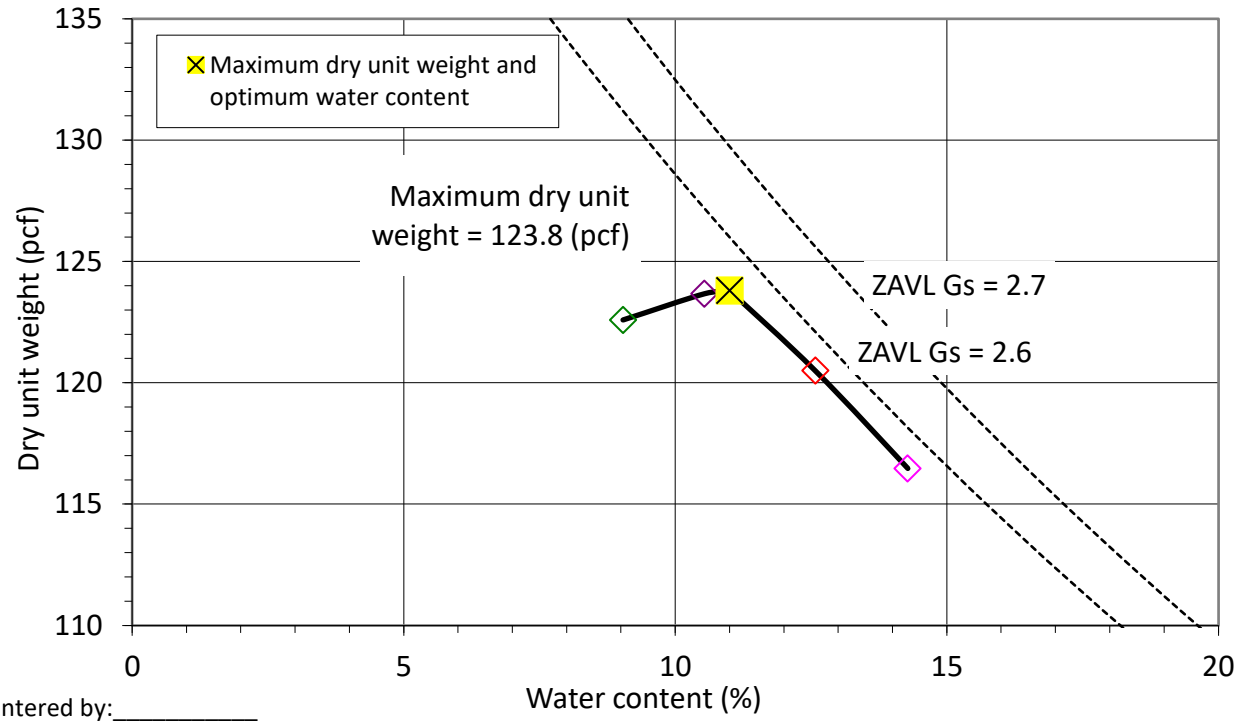
*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 8.4
Corrected dry unit weight (pcf): 132.3

Oversized fraction, +3/4-in. (%): 25.6
Water content, +3/4-in. (%): 1.0
Sieve for oversized fraction: 3/4-in.
Bulk specific gravity, Gs: 2.65 Assumed

Comments:
*Previously compacted material was used to create points +2% and +4% due to insufficient sample.



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Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: KC

Boring No.: TP-2
Station: 10
Depth: 4.0'
Sample Description: Reddish brown clayey gravel with sand
Engineering Classification: Not requested
As-received water content (%): Not requested

Method: ASTM D1557 C
Mold Id. INC 4
Mold volume (ft^3): 0.0750

Preparation method: Moist
Rammer: Mechanical-sector face
Rock Correction: Yes * See results below
Percent fraction retained, Pc (%) 24.7
Percent fraction passing, Pf (%) 75.3

Optimum water content (%): 7.3
Maximum dry unit weight (pcf): 131.3

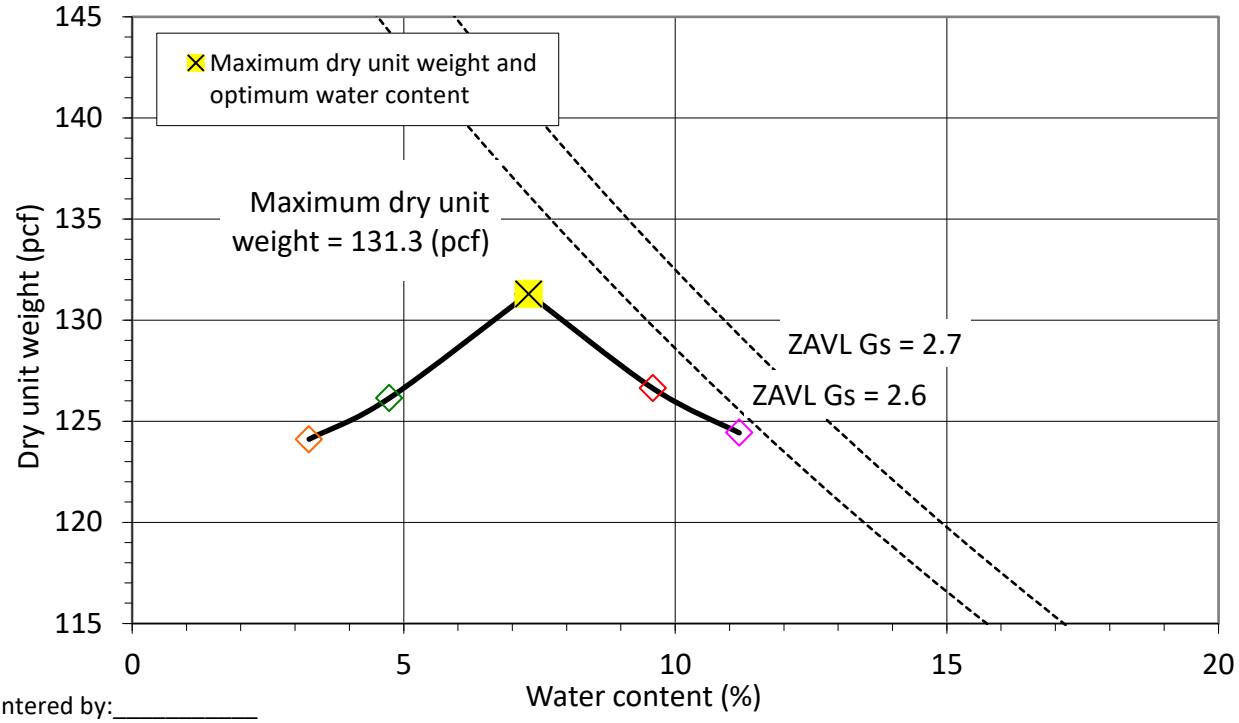
Point Number	As is	+2%	-2%	+4%	-4%			
Wt. Sample + Mold (g)	10346.0	10274.6	10047.6	10259.8	9912.8			
Wt. of Mold (g)	5552.2	5552.2	5552.2	5552.2	5552.2			
Total Unit Wt., γ (pcf)	140.9	138.8	132.1	138.3	128.1			
Wet Soil + Tare (g)	1705.58	1429.53	1453.75	1809.67	1550.69			
Dry Soil + Tare (g)	1617.49	1333.42	1406.61	1668.87	1516.48			
Tare (g)	409.63	330.82	409.69	408.94	464.95			
Water Content, w (%)	7.3	9.6	4.7	11.2	3.3			
Dry Unit Wt., γ_d (pcf)	131.3	126.6	126.1	124.4	124.1			

*Correction of Unit Weight and Water Content for Soils Containing Oversize Particles

(ASTM D4718)

Corrected water content (%): 6.9
Corrected dry unit weight (pcf): 138.3

Oversized fraction, +3/4-in. (%): 24.7
Water content, +3/4-in. (%): 5.8
Sieve for oversized fraction: 3/4-in.
Bulk specific gravity, Gs: 2.65 Assumed



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California Bearing Ratio

(ASTM D 1883)

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Project: Shelter Hill, Summit LLC
Number: 01628-040
Location: Powder Mountain, UT
Date: 8/7/2024
By: JJ

Boring No.: TP-23
Station: 22
Depth: 2.5'
Original Method: ASTM D1557 C
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 126.2
Optimum Water Content (%): 9.3
Relative Compaction (%): 100.0
0.1 in. Corrected CBR (%): 63.8
0.2 in. Corrected CBR (%): 84.6

As Compacted Data			Before	After
Mold Id.	CBR-8	Wet Soil + Tare (g)	685.03	679.90
Wt. of Mold + Sample (g)	11265.7	Dry Soil + Tare (g)	639.53	639.60
Wt. of Mold (g)	6571.6	Tare (g)	167.61	211.30
Dry Unit Weight (pcf)	126.3	Water Content (%)	9.6	9.4
After Soaking Data			**Average**	**Top 1 in.**
Wt. of Mold + Sample (g)	11347.5	Wet Soil + Tare (g)	1393.08	486.96
Dry Unit Weight (pcf)	128.6	Dry Soil + Tare (g)	1289.56	449.84
		Tare (g)	214.14	117.33
		Water Content (%)	9.6	11.2

Swell Data

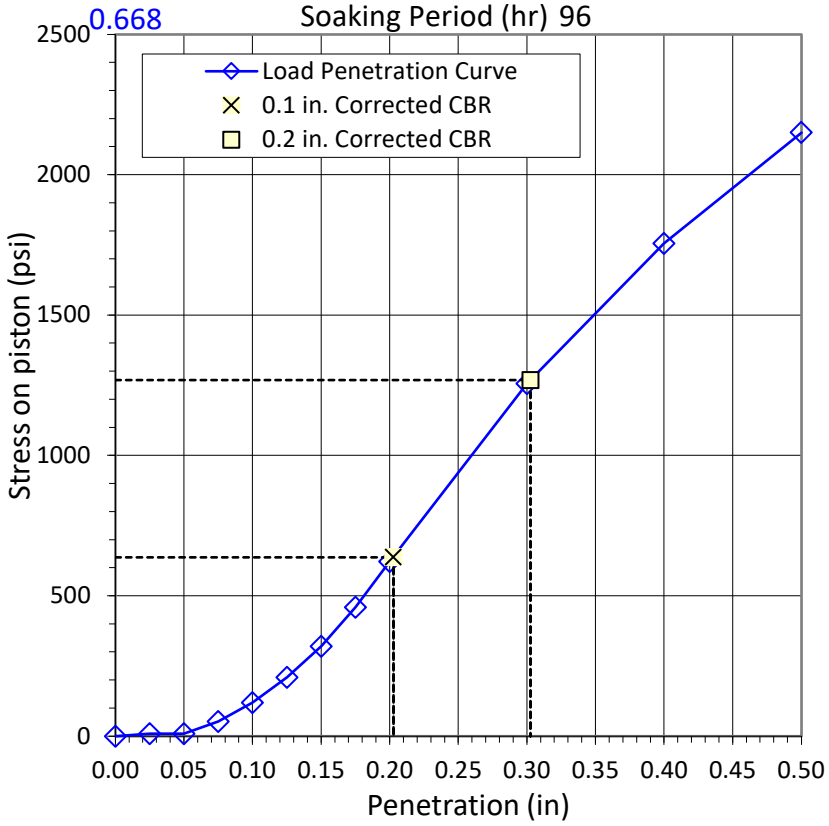
Date	Time	Dial
8/2/2024	9:50	0.676
8/6/2024	9:56	0.668

Surcharge (psf) 50
Swell (%) -0.17
Soaking Period (hr) 96

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	25	8	
0.050	25	8	
0.075	157	52	
0.100	359	120	1000
0.125	629	210	1125
0.150	958	319	1250
0.175	1378	459	1375
0.200	1865	622	1500
0.300	3766	1255	1900
0.400	5264	1755	2300
0.500	6451	2150	2600



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California Bearing Ratio

(ASTM D 1883)

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Project: Shelter Hill, Summit LLC
Number: 01628-040
Location: Powder Mountain, UT
Date: 8/13/2024
By: KC

Boring No.: TP-14
Station: 18
Depth: 4.5'
Original Method: ASTM D1557 C
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 127.4
Optimum Water Content (%): 10.4
Relative Compaction (%): 100.0
0.1 in. Corrected CBR (%): 16.7
0.2 in. Corrected CBR (%): 20.4

As Compacted Data			Before	After
Mold Id.	B	Wet Soil + Tare (g)	2050.80	1160.73
Wt. of Mold + Sample (g)	11976.5	Dry Soil + Tare (g)	1893.59	1070.85
Wt. of Mold (g)	7186.7	Tare (g)	385.71	219.36
Dry Unit Weight (pcf)	127.4	Water Content (%)	10.4	10.6
After Soaking Data			**Average**	**Top 1 in.**
Wt. of Mold + Sample (g)	12003.9	Wet Soil + Tare (g)	1276.09	814.89
Dry Unit Weight (pcf)	127.8	Dry Soil + Tare (g)	1175.31	755.28
		Tare (g)	221.72	211.54
		Water Content (%)	10.6	11.0

Swell Data

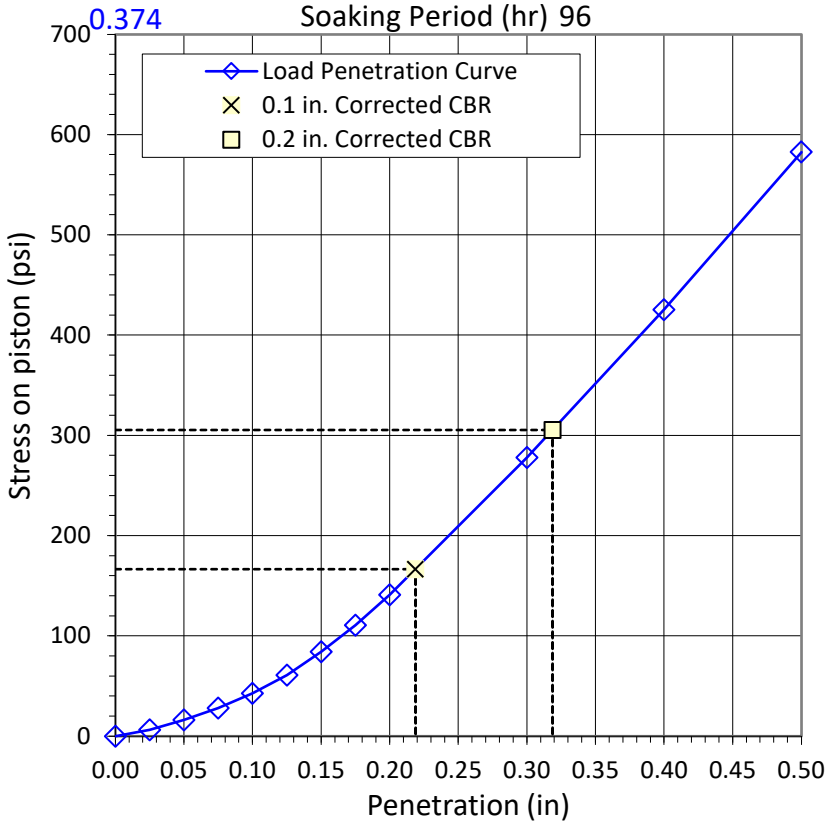
Date	Time	Dial
8/8/2024	9:50	0.366
8/12/2024	9:50	0.374

Surcharge (psf) 50
Swell (%) 0.17
Soaking Period (hr) 96

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	19	6	
0.050	49	16	
0.075	84	28	
0.100	128	43	1000
0.125	182	61	1125
0.150	252	84	1250
0.175	332	111	1375
0.200	423	141	1500
0.300	834	278	1900
0.400	1276	425	2300
0.500	1748	583	2600



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California Bearing Ratio

(ASTM D 1883)

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Project: Shelter Hill, Summit LLC
Number: 01628-040
Location: Powder Mountain, UT
Date: 8/13/2024
By: KC

Boring No.: TP-2
Station: 10
Depth: 4.0'
Original Method: ASTM D1557 B
Engineering Classification: Not requested
Condition of Sample: Soaked
Scalp and Replace: No

Maximum Dry Unit Weight (pcf): 131.3
Optimum Water Content (%): 7.3
Relative Compaction (%): 100.5
0.1 in. Corrected CBR (%): 62.3
0.2 in. Corrected CBR (%): 78.3

As Compacted Data			Before	After
Mold Id.	4	Wet Soil + Tare (g)	1705.58	1565.82
Wt. of Mold + Sample (g)	11960.4	Dry Soil + Tare (g)	1617.49	1478.12
Wt. of Mold (g)	7163.9	Tare (g)	409.63	214.96
Dry Unit Weight (pcf)	132.0	Water Content (%)	7.3	6.9
After Soaking Data			**Average**	**Top 1 in.**
Wt. of Mold + Sample (g)	12072.2	Wet Soil + Tare (g)	1074.29	1128.80
Dry Unit Weight (pcf)	133.0	Dry Soil + Tare (g)	1031.19	1096.16
		Tare (g)	541.37	734.97
		Water Content (%)	8.8	9.0

Swell Data

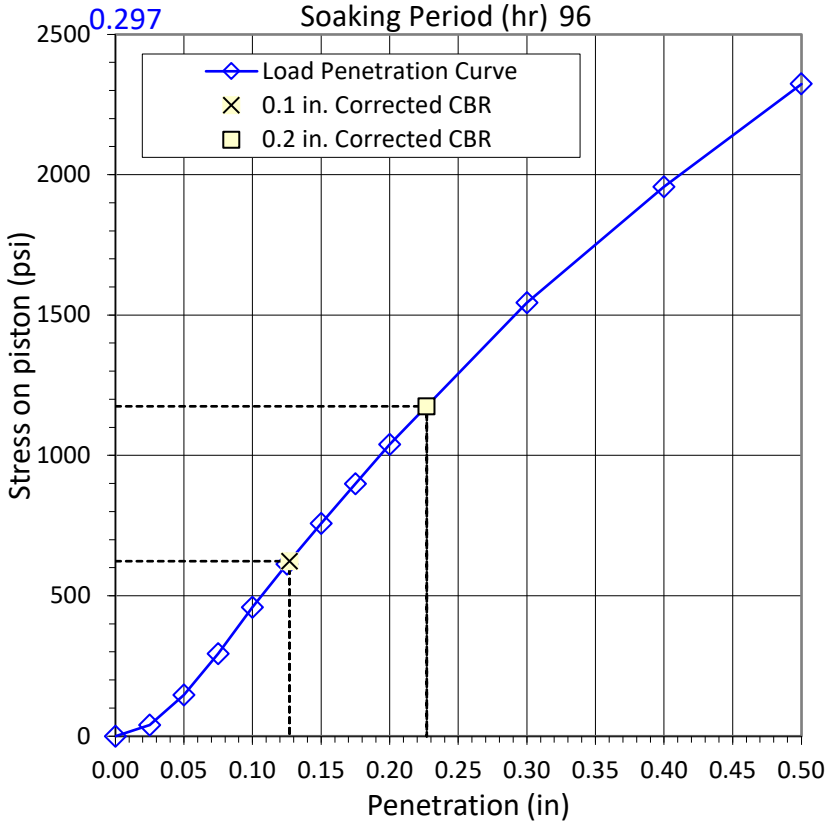
Date	Time	Dial
8/9/2024	10:30	0.299
8/13/2024	10:30	0.297

Surcharge (psf) 50
Swell (%) -0.04
Soaking Period (hr) 96

Penetration Data	Piston ID	CBR T1

Zero load (lb) = 0
Area of Piston (in^2) = 3.0

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	118	39	
0.050	441	147	
0.075	880	293	
0.100	1376	459	1000
0.125	1838	612	1125
0.150	2273	758	1250
0.175	2697	899	1375
0.200	3117	1039	1500
0.300	4634	1545	1900
0.400	5870	1956	2300
0.500	6970	2323	2600



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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

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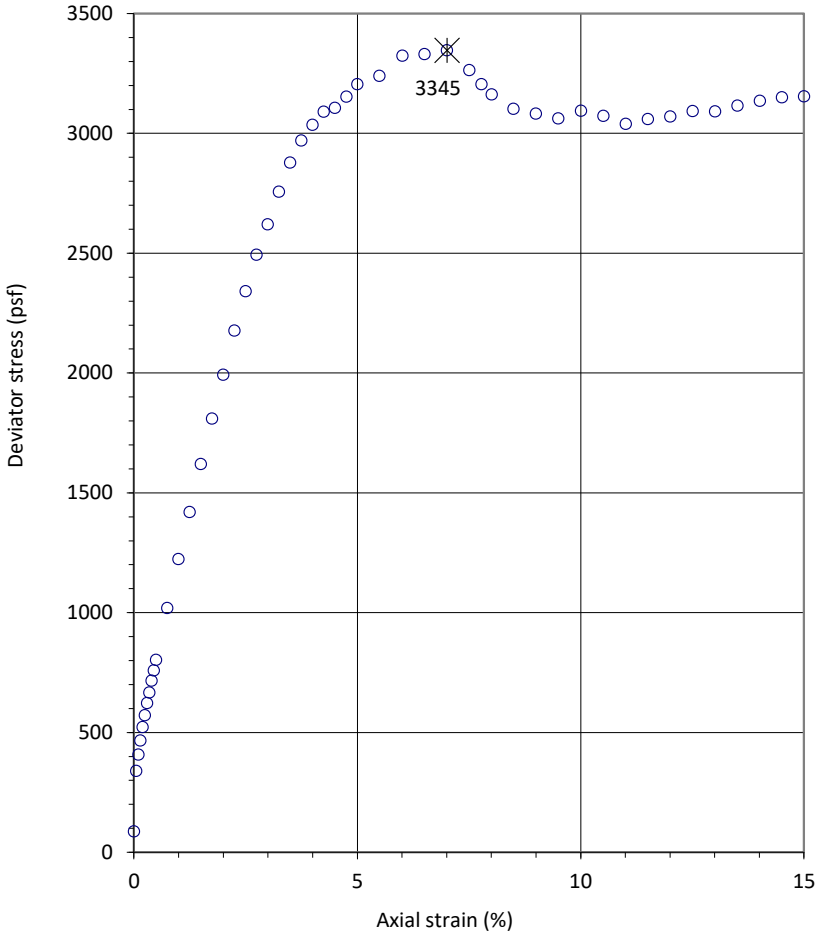
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-31
Station: 18
Depth: 7.5'
Sample Description: Red clayey sand
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, Gs	2.70	Assumed
Sample height, H (in.)	5.561	
Sample diameter, D (in.)	2.404	
Sample volume, V (ft^3)	0.0146	
Wt. rings + wet soil (g)	851.68	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	851.68	
Moist unit wt., γ_m (pcf)	128.5	
Dry unit wt., γ_d (pcf)	**113.9**	
Saturation (%)	72.0	
Void ratio, *e*	0.48	

Wet soil + tare (g)	374.39
Dry soil + tare (g)	349.97
Tare (g)	160.16
Water content, w (%)	**12.9**
Confining stress, σ_3 (psf)	493
Shear rate (in/min)	0.0167
Strain at failure, ε_f (%)	7.01
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	3345
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	1673

Axial Strain	σ_d $\sigma_1-\sigma_3$	Q 1/2 σ_d
0.00	85.5	42.7
0.05	338.2	169.1
0.10	405.7	202.9
0.15	465.1	232.6
0.20	520.5	260.3
0.25	571.0	285.5
0.30	620.8	310.4
0.35	665.5	332.8
0.40	714.7	357.3
0.45	757.3	378.7
0.50	801.4	400.7
0.75	1018.3	509.1
1.00	1221.5	610.8
1.25	1418.8	709.4
1.50	1619.3	809.6
1.75	1807.9	904.0
2.00	1991.7	995.8
2.25	2175.5	1087.7
2.50	2339.1	1169.5
2.75	2491.9	1246.0
3.00	2619.3	1309.7
3.25	2755.3	1377.6
3.50	2876.8	1438.4
3.75	2969.2	1484.6
4.00	3034.1	1517.0
4.25	3088.2	1544.1
4.50	3104.6	1552.3
4.76	3151.8	1575.9
5.00	3204.0	1602.0
5.50	3238.8	1619.4
6.01	3322.1	1661.1
6.51	3329.6	1664.8
7.01	3345.3	1672.7
7.51	3261.9	1630.9
7.78	3203.1	1601.6
8.01	3161.3	1580.6
8.50	3101.3	1550.6
9.00	3081.3	1540.7
9.50	3060.6	1530.3
10.01	3093.3	1546.7
10.51	3071.3	1535.6
11.01	3038.0	1519.0
11.51	3057.5	1528.8
12.01	3069.2	1534.6
12.51	3092.1	1546.0
13.01	3090.2	1545.1
13.51	3114.7	1557.4
14.01	3134.4	1567.2
14.51	3148.3	1574.1
15.00	3153.5	1576.7



Entered by:_____

Reviewed:_____

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

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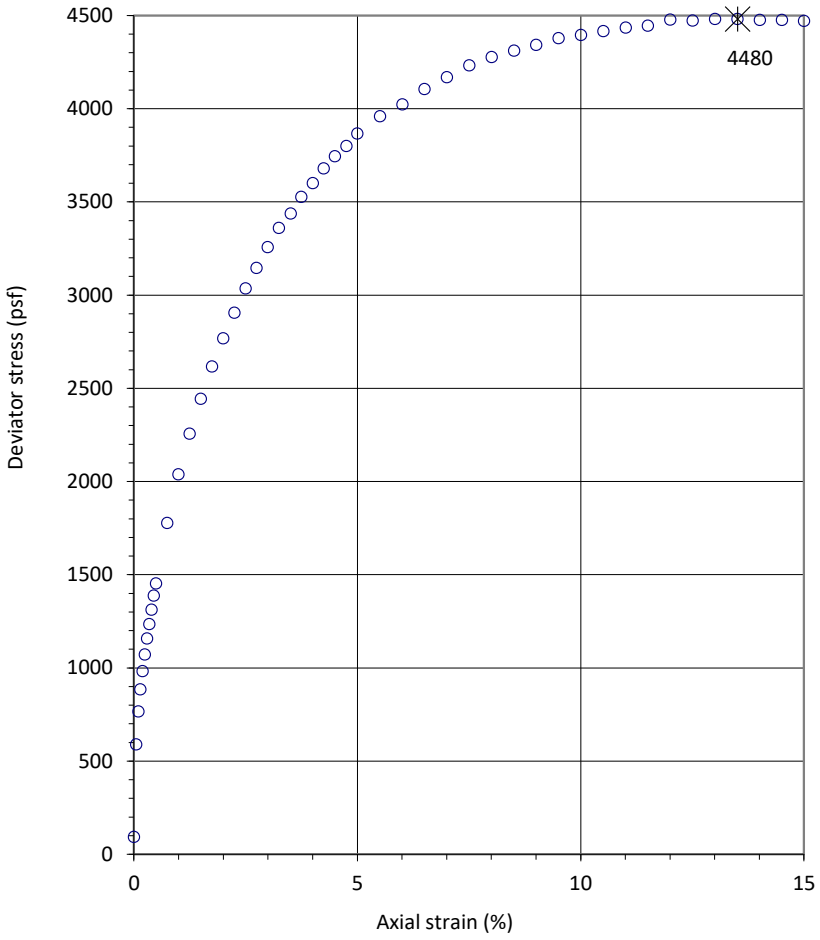
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-27
Station: 8
Depth: 4.0'
Sample Description: Reddish brown clay with sand
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, Gs	2.70	Assumed
Sample height, H (in.)	5.997	
Sample diameter, D (in.)	2.405	
Sample volume, V (ft^3)	0.0158	
Wt. rings + wet soil (g)	906.24	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	906.24	
Moist unit wt., γ_m (pcf)	126.7	
Dry unit wt., γ_d (pcf)	**104.6**	
Saturation (%)	93.0	
Void ratio, *e*	0.61	

Wet soil + tare (g)	378.57
Dry soil + tare (g)	334.81
Tare (g)	128.21
Water content, w (%)	**21.2**
Confining stress, σ_3 (psf)	488
Shear rate (in/min)	0.0180
Strain at failure, ε_f (%)	13.51
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	4480
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	2240

Axial Strain	σ_d $\sigma_1-\sigma_3$	Q 1/2 σ_d
0.00	91.9	46.0
0.05	587.7	293.9
0.10	764.0	382.0
0.15	882.2	441.1
0.20	979.9	489.9
0.25	1070.2	535.1
0.30	1155.5	577.7
0.35	1233.3	616.7
0.40	1310.2	655.1
0.45	1385.0	692.5
0.50	1451.4	725.7
0.75	1775.0	887.5
1.00	2036.6	1018.3
1.25	2254.2	1127.1
1.50	2441.7	1220.9
1.75	2614.4	1307.2
2.00	2765.6	1382.8
2.25	2904.0	1452.0
2.50	3034.3	1517.2
2.75	3143.6	1571.8
3.00	3255.4	1627.7
3.25	3358.3	1679.1
3.51	3435.6	1717.8
3.75	3525.8	1762.9
4.01	3598.4	1799.2
4.25	3677.2	1838.6
4.50	3742.2	1871.1
4.76	3798.5	1899.3
5.00	3864.1	1932.0
5.51	3958.1	1979.0
6.01	4020.3	2010.2
6.51	4103.4	2051.7
7.01	4166.8	2083.4
7.51	4229.8	2114.9
8.01	4275.0	2137.5
8.51	4309.8	2154.9
9.01	4340.8	2170.4
9.51	4376.8	2188.4
10.01	4393.7	2196.9
10.51	4414.4	2207.2
11.01	4432.7	2216.3
11.51	4444.0	2222.0
12.01	4476.3	2238.2
12.51	4470.0	2235.0
13.01	4478.9	2239.4
13.51	4479.6	2239.8
14.01	4473.7	2236.9
14.51	4475.0	2237.5
15.00	4468.7	2234.4



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Reviewed:_____

Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

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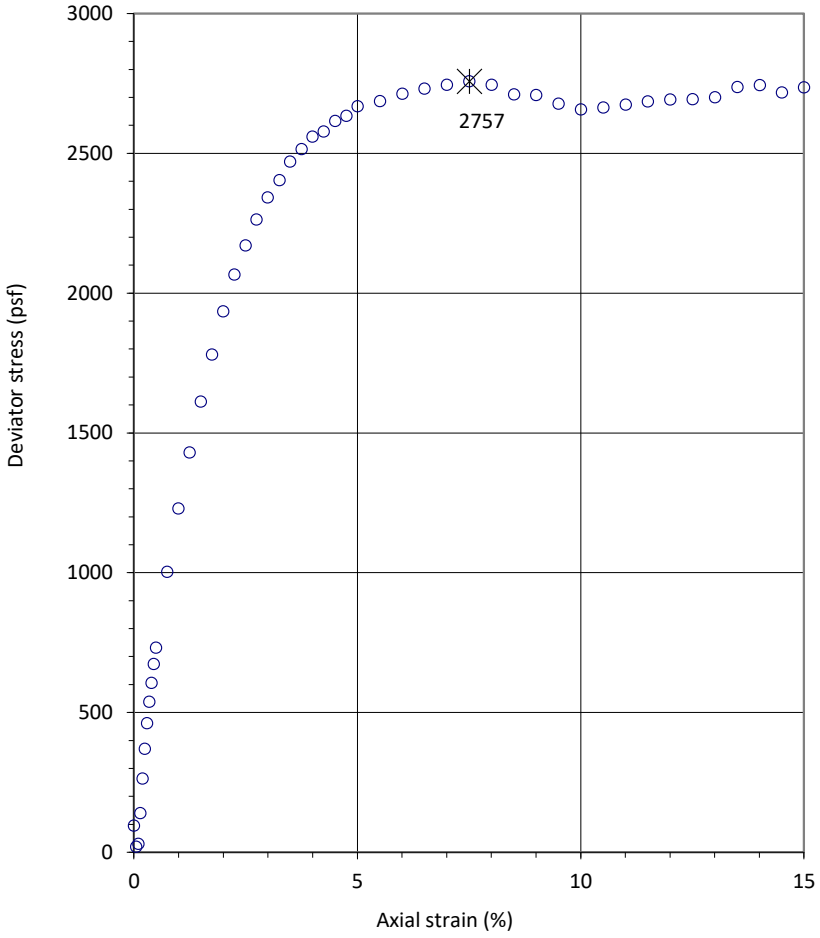
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-26
Station: 20
Depth: 5.0'
Sample Description: Reddish brown sandy clay
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, Gs	2.70	Assumed
Sample height, H (in.)	5.720	
Sample diameter, D (in.)	2.400	
Sample volume, V (ft^3)	0.0150	
Wt. rings + wet soil (g)	871.85	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	871.85	
Moist unit wt., γ_m (pcf)	128.4	
Dry unit wt., γ_d (pcf)	**110.6**	
Saturation (%)	82.2	
Void ratio, *e*	0.53	

Wet soil + tare (g)	451.85
Dry soil + tare (g)	418.53
Tare (g)	210.57
Water content, w (%)	**16.0**
Confining stress, σ_3 (psf)	490
Shear rate (in/min)	0.0172
Strain at failure, ε_f (%)	7.51
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	2757
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	1378

Axial Strain	σ_d $\sigma_1-\sigma_3$	Q 1/2 σ_d
0.00	94.5	47.2
0.05	18.1	9.1
0.10	29.3	14.6
0.15	138.6	69.3
0.20	262.1	131.0
0.25	368.6	184.3
0.30	460.2	230.1
0.35	537.3	268.7
0.40	605.0	302.5
0.45	671.9	336.0
0.50	730.7	365.4
0.75	1001.1	500.6
1.00	1228.3	614.2
1.25	1428.4	714.2
1.50	1610.4	805.2
1.75	1779.2	889.6
2.00	1933.8	966.9
2.25	2064.4	1032.2
2.50	2169.4	1084.7
2.75	2262.1	1131.1
3.00	2341.3	1170.7
3.26	2402.4	1201.2
3.50	2468.9	1234.4
3.76	2514.1	1257.0
4.00	2558.6	1279.3
4.25	2576.5	1288.3
4.51	2614.4	1307.2
4.76	2632.7	1316.4
5.01	2666.9	1333.4
5.51	2685.7	1342.9
6.01	2711.3	1355.6
6.51	2729.8	1364.9
7.01	2743.8	1371.9
7.51	2756.8	1378.4
8.01	2743.9	1371.9
8.51	2708.8	1354.4
9.01	2706.7	1353.4
9.51	2676.3	1338.1
10.01	2655.7	1327.9
10.51	2661.9	1331.0
11.01	2672.8	1336.4
11.51	2684.1	1342.0
12.01	2691.3	1345.6
12.51	2692.7	1346.3
13.01	2698.8	1349.4
13.51	2735.9	1367.9
14.01	2742.5	1371.3
14.51	2716.2	1358.1
15.00	2734.2	1367.1



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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

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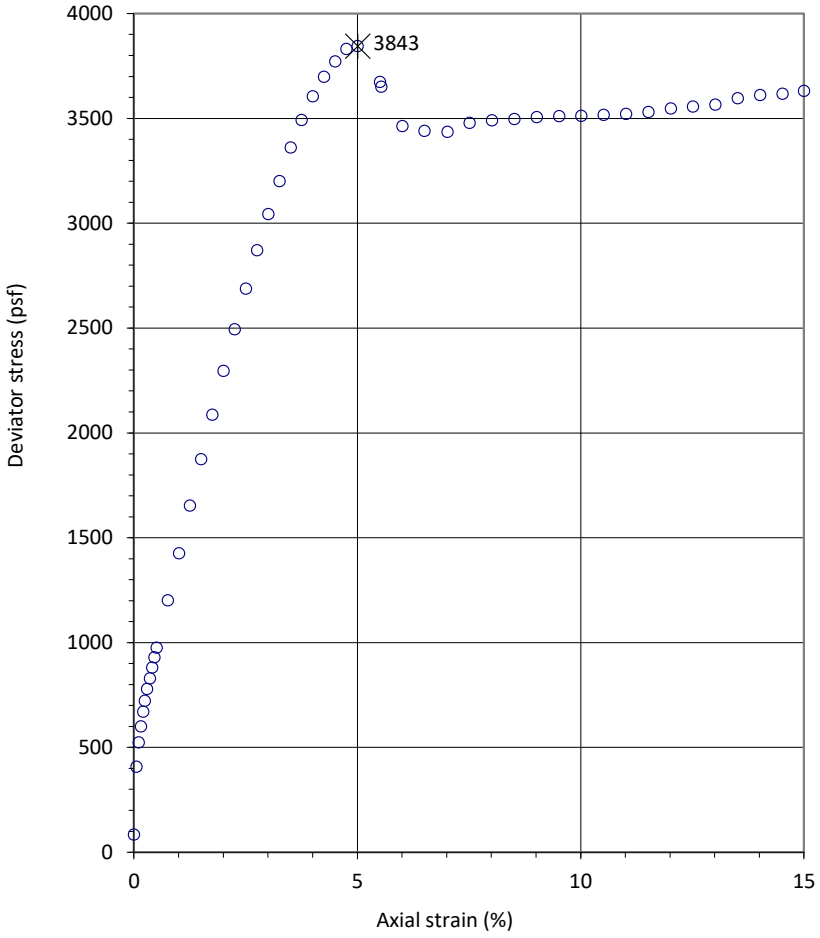
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-13
Station: 25
Depth: 8.0'
Sample Description: Red clay with sand
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, Gs	2.70	Assumed
Sample height, H (in.)	5.642	
Sample diameter, D (in.)	2.402	
Sample volume, V (ft^3)	0.0148	
Wt. rings + wet soil (g)	918.64	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	918.64	
Moist unit wt., γ_m (pcf)	136.9	
Dry unit wt., γ_d (pcf)	**121.6**	
Saturation (%)	87.4	
Void ratio, *e*	0.39	

Wet soil + tare (g)	360.57
Dry soil + tare (g)	334.64
Tare (g)	128.51
Water content, w (%)	**12.6**
Confining stress, σ_3 (psf)	494
Shear rate (in/min)	0.0169
Strain at failure, ε_f (%)	5.01
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	3843
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	1921

Axial Strain	σ_d $\sigma_1-\sigma_3$	Q 1/2 σ_d
0.00	82.6	41.3
0.06	405.5	202.8
0.11	521.7	260.9
0.16	598.9	299.4
0.21	668.9	334.5
0.25	721.0	360.5
0.30	776.6	388.3
0.36	827.9	414.0
0.41	879.9	439.9
0.46	927.6	463.8
0.51	974.5	487.2
0.76	1199.1	599.5
1.01	1423.8	711.9
1.26	1651.8	825.9
1.51	1873.3	936.7
1.76	2084.4	1042.2
2.01	2293.8	1146.9
2.26	2492.8	1246.4
2.51	2686.6	1343.3
2.76	2868.7	1434.3
3.01	3042.4	1521.2
3.26	3199.4	1599.7
3.51	3358.8	1679.4
3.76	3490.8	1745.4
4.01	3602.6	1801.3
4.26	3696.0	1848.0
4.51	3769.3	1884.7
4.76	3828.9	1914.5
5.01	3842.8	1921.4
5.51	3672.4	1836.2
5.54	3648.7	1824.4
6.01	3462.1	1731.0
6.51	3439.0	1719.5
7.02	3433.5	1716.8
7.52	3477.0	1738.5
8.02	3489.5	1744.8
8.52	3495.3	1747.7
9.02	3504.5	1752.2
9.52	3508.8	1754.4
10.02	3509.6	1754.8
10.52	3514.1	1757.1
11.02	3519.9	1759.9
11.52	3527.9	1763.9
12.02	3545.3	1772.7
12.52	3554.2	1777.1
13.02	3564.0	1782.0
13.52	3593.8	1796.9
14.02	3609.0	1804.5
14.52	3615.4	1807.7
15.00	3629.3	1814.7



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Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils

(ASTM D2850)

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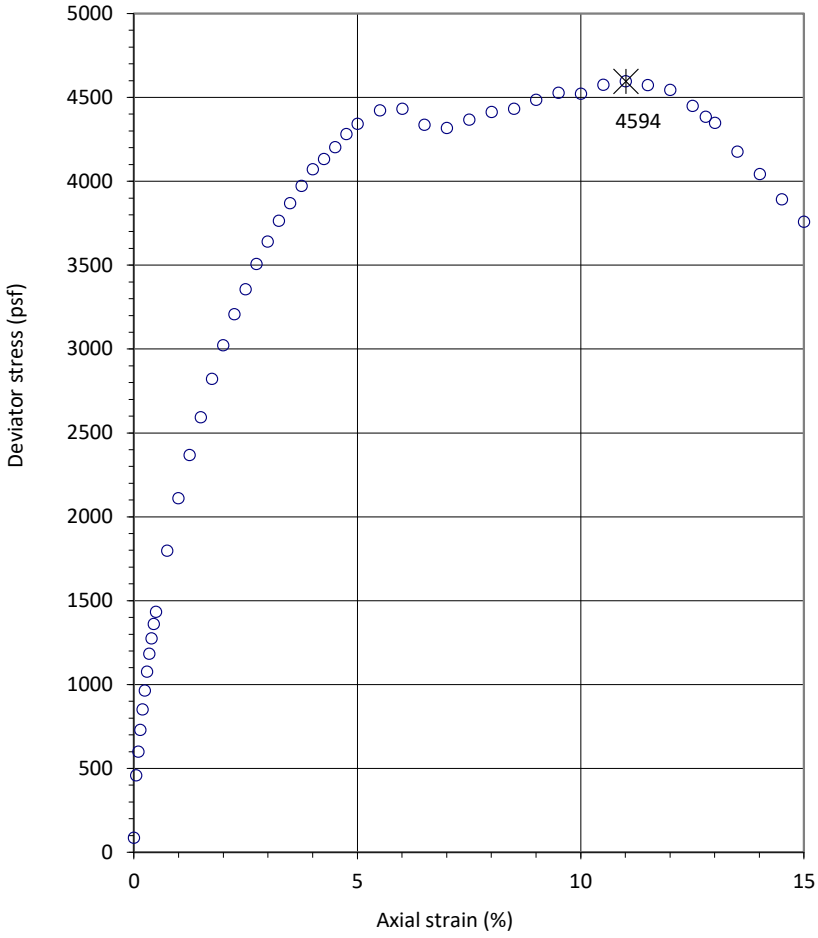
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/8/2024
By: RH

Boring No.: TP-3
Station: 14
Depth: 7.5'
Sample Description: Red clay
Sample type: Undisturbed-trimmed from thin-wall

Specific gravity, Gs	2.70	Assumed
Sample height, H (in.)	5.802	
Sample diameter, D (in.)	2.402	
Sample volume, V (ft^3)	0.0152	
Wt. rings + wet soil (g)	871.46	
Wt. rings/tare (g)	0.00	
Moist soil, Ws (g)	871.46	
Moist unit wt., γ_m (pcf)	126.3	
Dry unit wt., γ_d (pcf)	**105.4**	
Saturation (%)	88.9	
Void ratio, *e*	0.60	

Wet soil + tare (g)	346.07
Dry soil + tare (g)	309.29
Tare (g)	124.04
Water content, w (%)	**19.9**
Confining stress, σ_3 (psf)	506
Shear rate (in/min)	0.0174
Strain at failure, ε_f (%)	11.01
Deviator stress at failure, $(\sigma_1-\sigma_3)_f$ (psf)	4594
Shear stress at failure, $q_f = (\sigma_1-\sigma_3)_f/2$ (psf)	2297

Axial Strain	σ_d $\sigma_1-\sigma_3$	Q 1/2 σ_d
0.00	83.7	41.8
0.05	456.5	228.2
0.10	598.1	299.0
0.15	727.9	363.9
0.20	849.1	424.6
0.25	961.3	480.7
0.30	1074.6	537.3
0.35	1181.4	590.7
0.40	1273.2	636.6
0.45	1357.9	679.0
0.50	1430.5	715.2
0.75	1795.8	897.9
1.00	2107.6	1053.8
1.25	2364.9	1182.5
1.50	2591.4	1295.7
1.75	2819.5	1409.7
2.00	3019.4	1509.7
2.25	3205.3	1602.7
2.50	3354.4	1677.2
2.75	3504.9	1752.4
3.00	3637.2	1818.6
3.25	3762.7	1881.3
3.50	3867.5	1933.7
3.76	3969.5	1984.8
4.01	4069.5	2034.8
4.26	4129.9	2065.0
4.51	4200.4	2100.2
4.76	4279.4	2139.7
5.01	4339.5	2169.8
5.51	4420.0	2210.0
6.01	4429.8	2214.9
6.51	4334.2	2167.1
7.01	4314.5	2157.2
7.51	4365.7	2182.9
8.01	4410.9	2205.5
8.51	4429.5	2214.7
9.01	4483.5	2241.8
9.51	4524.2	2262.1
10.01	4519.3	2259.6
10.51	4573.0	2286.5
11.01	4594.3	2297.1
11.51	4571.3	2285.7
12.01	4542.4	2271.2
12.51	4447.2	2223.6
12.80	4381.3	2190.6
13.01	4345.2	2172.6
13.51	4173.5	2086.7
14.01	4040.2	2020.1
14.51	3890.2	1945.1
15.00	3755.7	1877.8



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Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/12/2024
By: PW

Boring No.: TP-31
Station: 15
Depth: 7.0'
Sample Description: Red clayey sand with gravel
Sample type: Laboratory compacted
Dry unit weight 117.2 pcf
at 12.3 (%) w
Compaction specifications: 94% of ASTM D1557B

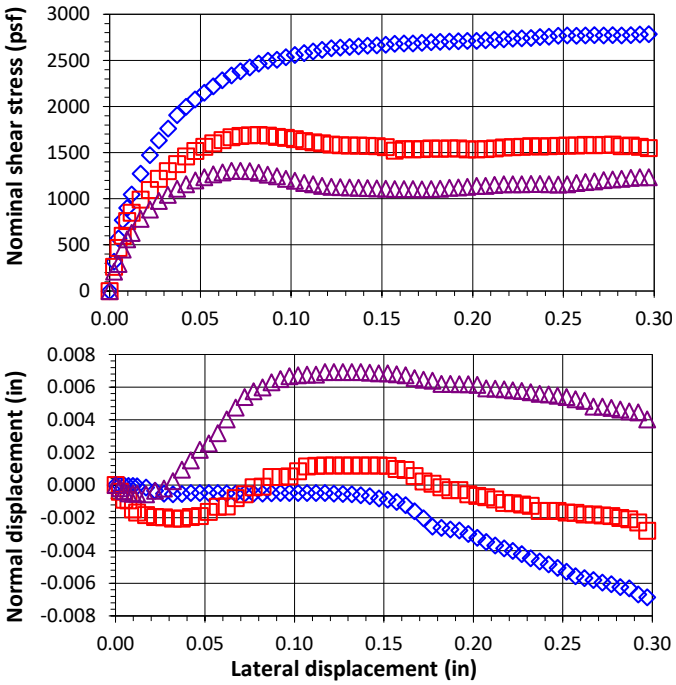
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0043
Specific gravity, Gs: 2.70 Assumed

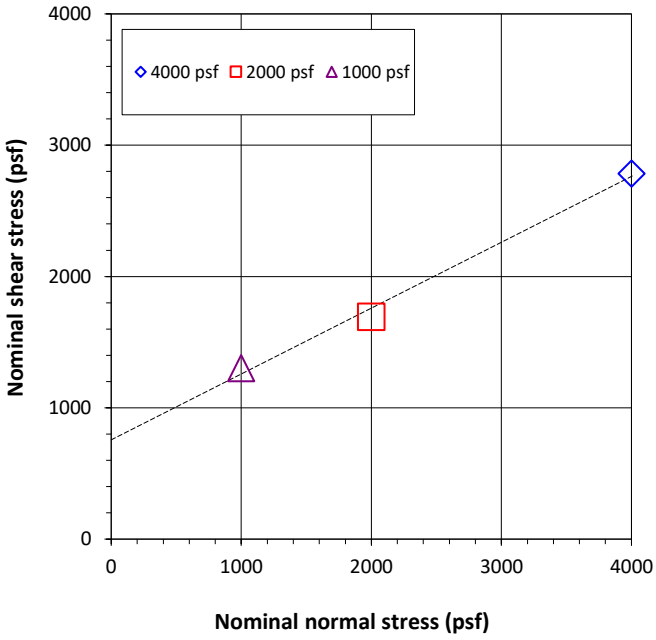
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4000		2000		1000	
Peak shear stress (psf)	2785		1692		1303	
Lateral displacement at peak (in)	0.297		0.082		0.067	
Load Duration (min)	1042		1056		1062	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.004	0.982	1.001	0.983	1.002	0.993
Specimen diameter (in)	2.413	2.413	2.413	2.413	2.414	2.414
Wt. rings + wet soil (g)	204.73	207.87	201.02	204.47	203.83	207.92
Wt. rings (g)	45.23	45.23	42.00	42.00	44.51	44.51
Wet soil + tare (g)	226.09		226.09		226.09	
Dry soil + tare (g)	214.30		214.30		214.30	
Tare (g)	121.87		121.87		121.87	
Water content (%)	12.8	15.0	12.8	15.2	12.8	15.6
Dry unit weight (pcf)	117.4	120.0	117.4	119.5	117.4	118.4
Void ratio, e, for assumed Gs	0.44	0.40	0.44	0.41	0.44	0.42
Saturation (%)*	79.0	100.0	79.0	100.0	79.0	100.0

ϕ' (deg)	27
c' (psf)	756

Average of 3 specimens	Initial	Pre-shear
Water content (%)	12.8	15.3
Dry unit weight (pcf)	117.4	119.3

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens remolded to 94% of maximum dry unit weight at optimum water content using material passing the No. 4 sieve. Test specimens swelled upon inundation and at the 125 and 250 psf load steps.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-31
Station: 15
Depth: 7.0'

Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	318	0.000	0.002	262	0.000	0.002	210	0.000
0.005	569	0.000	0.005	467	-0.001	0.005	294	0.000
0.007	769	0.000	0.007	598	-0.001	0.007	448	0.000
0.010	901	0.000	0.010	760	-0.001	0.010	560	-0.001
0.012	1046	0.000	0.012	850	-0.002	0.012	628	-0.001
0.017	1271	0.000	0.017	991	-0.002	0.017	782	-0.001
0.022	1473	0.000	0.022	1096	-0.002	0.022	882	0.000
0.027	1633	-0.001	0.027	1217	-0.002	0.027	975	0.000
0.032	1760	-0.001	0.032	1299	-0.002	0.032	1043	0.000
0.037	1908	-0.001	0.037	1375	-0.002	0.037	1108	0.001
0.042	1995	0.000	0.042	1460	-0.002	0.042	1159	0.002
0.047	2078	0.000	0.047	1520	-0.002	0.047	1198	0.002
0.052	2151	0.000	0.052	1563	-0.002	0.052	1235	0.003
0.057	2218	0.000	0.057	1603	-0.001	0.057	1265	0.003
0.062	2283	-0.001	0.062	1637	-0.001	0.062	1286	0.004
0.067	2335	-0.001	0.067	1666	-0.001	0.067	1303	0.005
0.072	2381	-0.001	0.072	1682	-0.001	0.072	1302	0.005
0.077	2425	-0.001	0.077	1690	0.000	0.077	1299	0.006
0.082	2464	-0.001	0.082	1692	0.000	0.082	1283	0.006
0.087	2495	-0.001	0.087	1684	0.000	0.087	1261	0.006
0.092	2505	0.000	0.092	1671	0.000	0.092	1243	0.006
0.097	2534	0.000	0.097	1662	0.001	0.097	1218	0.007
0.102	2557	0.000	0.102	1648	0.001	0.102	1197	0.007
0.107	2578	0.000	0.107	1627	0.001	0.107	1173	0.007
0.112	2596	0.000	0.112	1611	0.001	0.112	1157	0.007
0.117	2614	0.000	0.117	1600	0.001	0.117	1141	0.007
0.122	2630	-0.001	0.122	1589	0.001	0.122	1129	0.007
0.127	2640	-0.001	0.127	1580	0.001	0.127	1125	0.007
0.132	2645	-0.001	0.132	1576	0.001	0.132	1122	0.007
0.137	2653	-0.001	0.137	1577	0.001	0.137	1119	0.007
0.142	2658	-0.001	0.142	1573	0.001	0.142	1115	0.007
0.147	2663	-0.001	0.147	1570	0.001	0.147	1111	0.007
0.152	2668	-0.001	0.152	1560	0.001	0.152	1110	0.007
0.157	2679	-0.001	0.157	1522	0.001	0.157	1107	0.007
0.162	2684	-0.001	0.162	1538	0.001	0.162	1106	0.007
0.167	2684	-0.002	0.167	1536	0.001	0.167	1105	0.007
0.172	2689	-0.002	0.172	1540	0.000	0.172	1103	0.006
0.177	2697	-0.003	0.177	1546	0.000	0.177	1104	0.006
0.182	2702	-0.003	0.182	1544	0.000	0.182	1108	0.006
0.187	2705	-0.003	0.187	1545	0.000	0.187	1120	0.006
0.192	2707	-0.003	0.192	1547	0.000	0.192	1123	0.006
0.197	2712	-0.003	0.197	1535	-0.001	0.197	1129	0.006
0.202	2712	-0.003	0.202	1536	-0.001	0.202	1139	0.006
0.207	2718	-0.003	0.207	1540	-0.001	0.207	1140	0.006
0.212	2720	-0.004	0.212	1547	-0.001	0.212	1149	0.006
0.217	2728	-0.004	0.217	1555	-0.001	0.217	1156	0.006
0.222	2736	-0.004	0.222	1560	-0.001	0.222	1159	0.006
0.227	2738	-0.004	0.227	1562	-0.001	0.227	1159	0.006
0.232	2743	-0.004	0.232	1570	-0.001	0.232	1162	0.006
0.237	2754	-0.005	0.237	1567	-0.002	0.237	1160	0.006
0.242	2756	-0.005	0.242	1570	-0.002	0.242	1156	0.006
0.247	2767	-0.005	0.247	1575	-0.002	0.247	1153	0.005
0.252	2769	-0.005	0.252	1578	-0.002	0.252	1159	0.005
0.257	2767	-0.006	0.257	1579	-0.002	0.257	1171	0.005
0.262	2769	-0.006	0.262	1583	-0.002	0.262	1182	0.005
0.267	2772	-0.006	0.267	1580	-0.002	0.267	1190	0.005
0.272	2769	-0.006	0.272	1585	-0.002	0.272	1202	0.005
0.277	2774	-0.006	0.277	1589	-0.002	0.277	1210	0.005
0.282	2769	-0.006	0.282	1570	-0.002	0.282	1218	0.005
0.287	2772	-0.006	0.287	1577	-0.002	0.287	1226	0.005
0.292	2780	-0.007	0.292	1565	-0.002	0.292	1234	0.004
0.297	2785	-0.007	0.297	1550	-0.003	0.297	1234	0.004

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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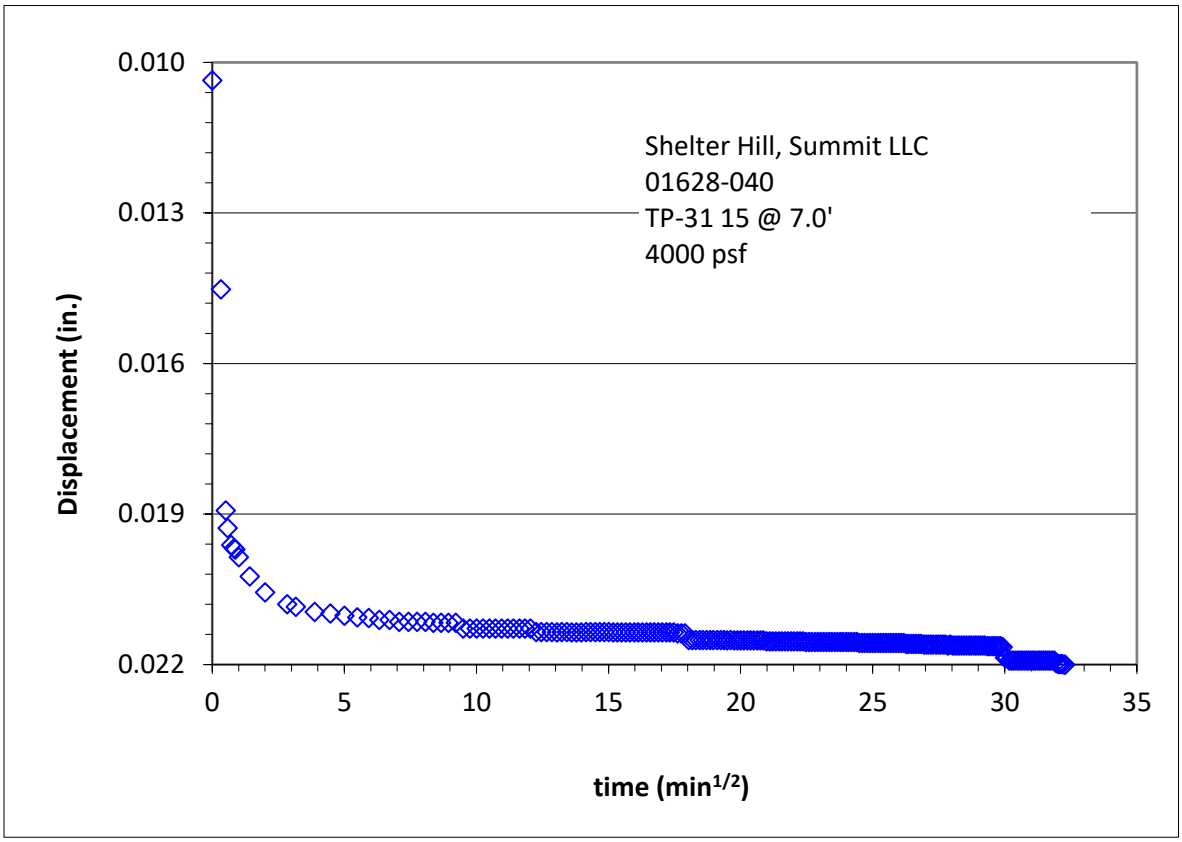
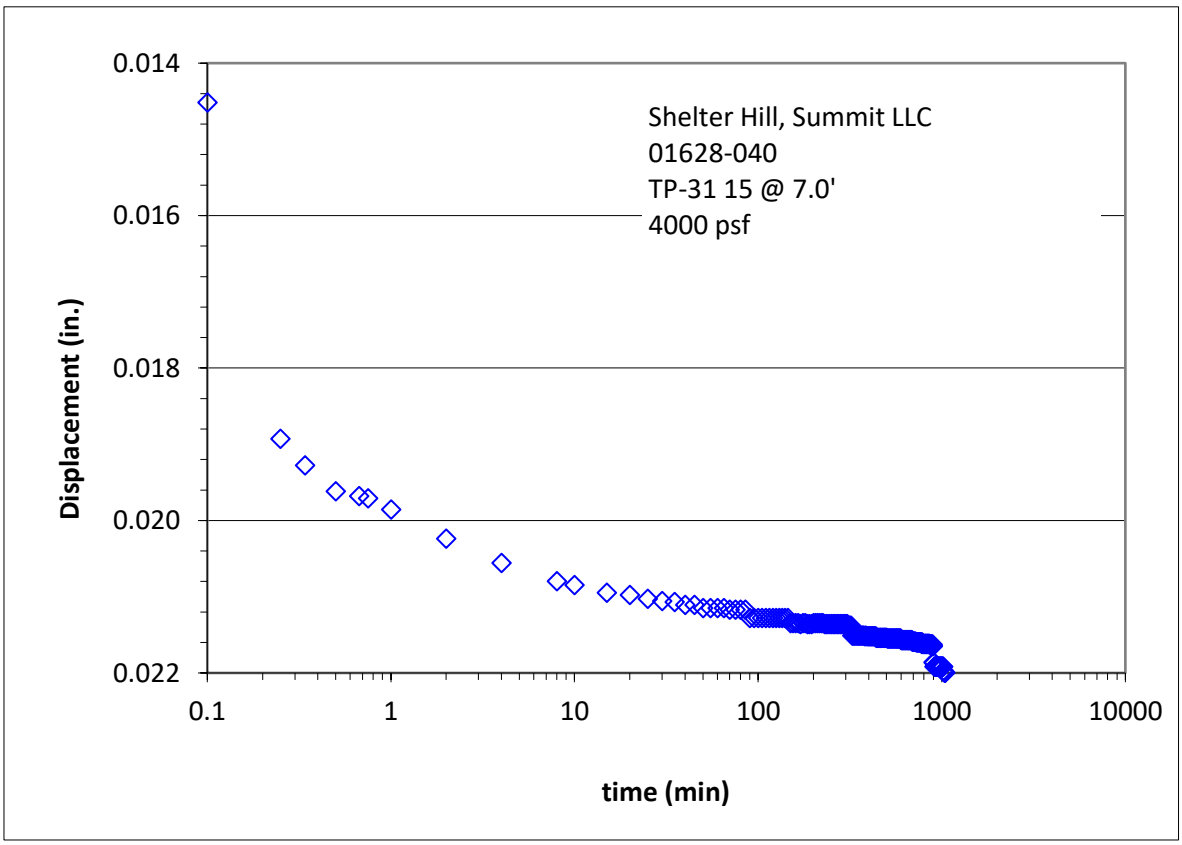
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-31
Station: 15
Depth: 7.0'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/12/2024
By: PW

Boring No.: TP-25
Station: 8
Depth: 6.5'
Sample Description: Red silty, clayey gravel with sand
Sample type: Laboratory compacted
Dry unit weight 120.7 pcf
at 8.2 (%) w
Compaction specifications: 94% of ASTM D1557C

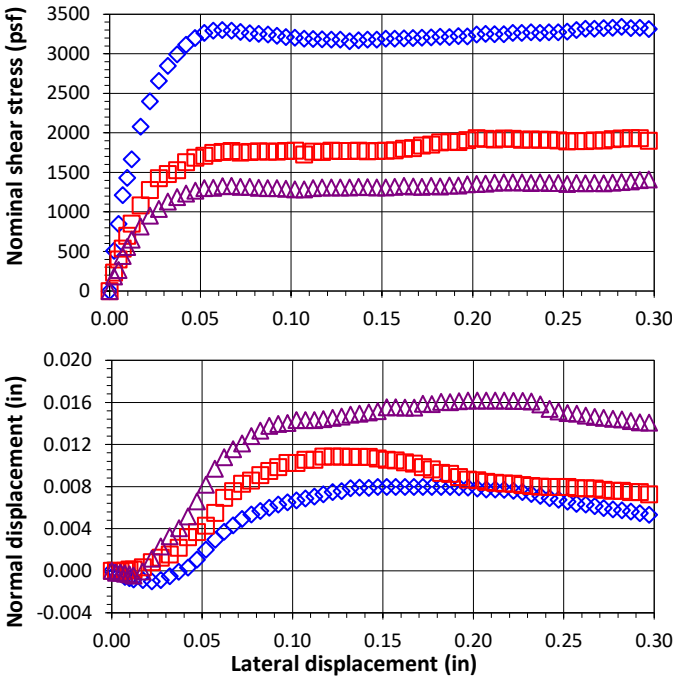
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0043
Specific gravity, Gs: 2.70 Assumed

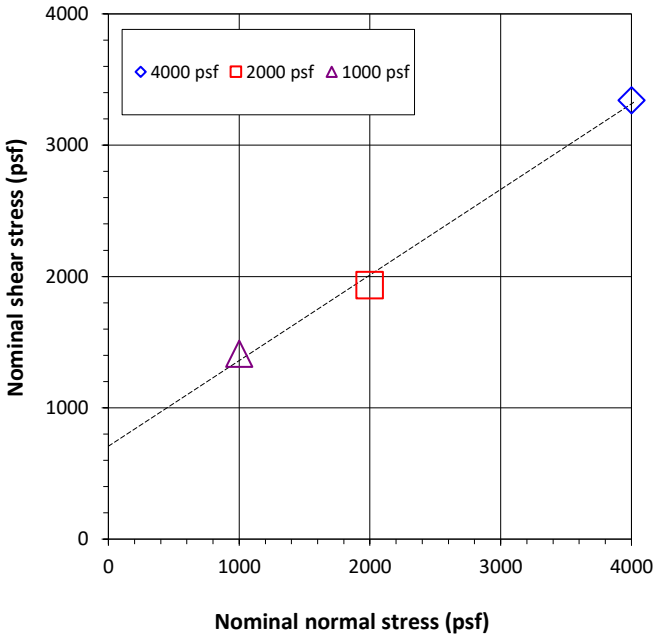
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4000		2000		1000	
Peak shear stress (psf)	3341		1934		1411	
Lateral displacement at peak (in)	0.282		0.287		0.297	
Load Duration (min)	876		896		909	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.002	0.978	1.001	0.972	1.000	0.989
Specimen diameter (in)	2.415	2.415	2.413	2.413	2.412	2.412
Wt. rings + wet soil (g)	200.50	207.66	199.47	206.20	202.11	210.24
Wt. rings (g)	42.58	42.58	41.99	41.99	44.93	44.93
Wet soil + tare (g)	198.16		198.16		198.16	
Dry soil + tare (g)	192.61		192.61		192.61	
Tare (g)	127.12		127.12		127.12	
Water content (%)	8.5	13.4	8.5	13.1	8.5	14.1
Dry unit weight (pcf)	120.8	123.7	120.8	124.4	120.8	122.1
Void ratio, e, for assumed Gs	0.39	0.36	0.40	0.35	0.40	0.38
Saturation (%)*	57.9	100.0	57.9	100.0	57.9	100.0

ϕ' (deg)	33
c' (psf)	708

Average of 3 specimens	Initial	Pre-shear
Water content (%)	8.5	13.5
Dry unit weight (pcf)	120.8	123.4

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens remolded to 94% of maximum dry unit weight at optimum water content using material passing the No. 4 sieve. Test specimens swelled upon inundation and at the 125 and 250 psf load steps.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-25
Station: 8
Depth: 6.5'

Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	506	0.000	0.002	235	0.000	0.002	186	0.000
0.005	850	0.000	0.005	401	0.000	0.005	264	0.000
0.007	1214	-0.001	0.007	537	0.000	0.007	441	0.000
0.010	1429	-0.001	0.010	698	0.000	0.010	558	0.000
0.012	1664	-0.001	0.012	851	0.000	0.012	651	0.000
0.017	2080	-0.001	0.017	1081	0.000	0.017	814	0.000
0.022	2400	-0.001	0.022	1278	0.001	0.022	952	0.001
0.027	2659	-0.001	0.027	1428	0.001	0.027	1039	0.002
0.032	2847	-0.001	0.032	1480	0.002	0.032	1130	0.003
0.037	2994	0.000	0.037	1527	0.002	0.037	1188	0.004
0.042	3113	0.000	0.042	1627	0.003	0.042	1232	0.005
0.047	3199	0.001	0.047	1685	0.004	0.047	1270	0.007
0.052	3263	0.002	0.052	1710	0.004	0.052	1302	0.008
0.057	3292	0.003	0.057	1746	0.005	0.057	1307	0.010
0.062	3299	0.004	0.062	1759	0.007	0.062	1326	0.011
0.067	3294	0.004	0.067	1772	0.008	0.067	1328	0.012
0.072	3276	0.005	0.072	1751	0.008	0.072	1317	0.012
0.077	3261	0.005	0.077	1758	0.009	0.077	1316	0.013
0.082	3253	0.006	0.082	1766	0.009	0.082	1305	0.013
0.087	3243	0.006	0.087	1763	0.009	0.087	1301	0.014
0.092	3227	0.006	0.092	1761	0.010	0.092	1303	0.014
0.097	3212	0.007	0.097	1772	0.010	0.097	1293	0.014
0.102	3204	0.007	0.102	1773	0.010	0.102	1286	0.014
0.107	3193	0.007	0.107	1726	0.011	0.107	1286	0.014
0.112	3188	0.007	0.112	1761	0.011	0.112	1302	0.014
0.117	3183	0.007	0.117	1759	0.011	0.117	1311	0.014
0.122	3181	0.007	0.122	1773	0.011	0.122	1309	0.015
0.127	3178	0.008	0.127	1772	0.011	0.127	1311	0.015
0.132	3157	0.008	0.132	1771	0.011	0.132	1308	0.015
0.137	3170	0.008	0.137	1776	0.011	0.137	1316	0.015
0.142	3181	0.008	0.142	1768	0.011	0.142	1312	0.015
0.147	3181	0.008	0.147	1771	0.011	0.147	1311	0.015
0.152	3191	0.008	0.152	1774	0.011	0.152	1310	0.016
0.157	3193	0.008	0.157	1778	0.010	0.157	1317	0.016
0.162	3196	0.008	0.162	1798	0.010	0.162	1328	0.015
0.167	3201	0.008	0.167	1809	0.010	0.167	1321	0.015
0.172	3204	0.008	0.172	1838	0.010	0.172	1316	0.016
0.177	3209	0.008	0.177	1851	0.010	0.177	1328	0.016
0.182	3214	0.008	0.182	1878	0.009	0.182	1323	0.016
0.187	3212	0.008	0.187	1887	0.009	0.187	1334	0.016
0.192	3224	0.008	0.192	1883	0.009	0.192	1332	0.016
0.197	3219	0.008	0.197	1908	0.009	0.197	1349	0.016
0.202	3245	0.008	0.202	1932	0.009	0.202	1352	0.016
0.207	3250	0.008	0.207	1926	0.008	0.207	1359	0.016
0.212	3248	0.008	0.212	1915	0.008	0.212	1369	0.016
0.217	3248	0.008	0.217	1930	0.008	0.217	1374	0.016
0.222	3266	0.008	0.222	1923	0.008	0.222	1375	0.016
0.227	3266	0.007	0.227	1914	0.008	0.227	1373	0.016
0.232	3271	0.007	0.232	1916	0.008	0.232	1368	0.016
0.237	3266	0.007	0.237	1911	0.008	0.237	1375	0.016
0.242	3274	0.007	0.242	1911	0.008	0.242	1366	0.015
0.247	3274	0.007	0.247	1905	0.008	0.247	1366	0.015
0.252	3281	0.007	0.252	1894	0.008	0.252	1355	0.015
0.257	3299	0.006	0.257	1896	0.008	0.257	1367	0.015
0.262	3315	0.006	0.262	1895	0.008	0.262	1361	0.015
0.267	3317	0.006	0.267	1904	0.008	0.267	1365	0.015
0.272	3323	0.006	0.272	1904	0.008	0.272	1362	0.015
0.277	3328	0.006	0.277	1920	0.008	0.277	1370	0.014
0.282	3341	0.006	0.282	1928	0.008	0.282	1380	0.014
0.287	3323	0.006	0.287	1934	0.007	0.287	1385	0.014
0.292	3330	0.005	0.292	1933	0.007	0.292	1404	0.014
0.297	3312	0.005	0.297	1899	0.007	0.297	1411	0.014

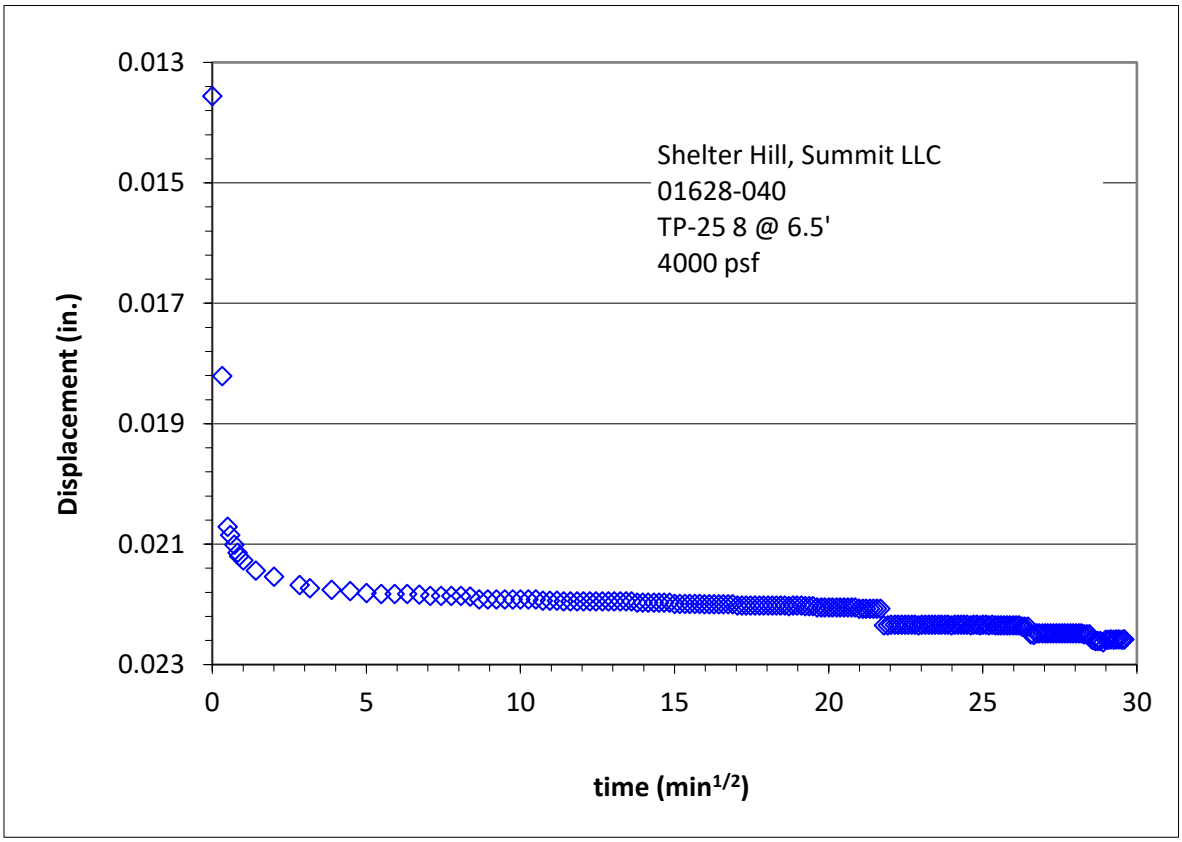
Direct Shear Test for Soils Under Drained Conditions

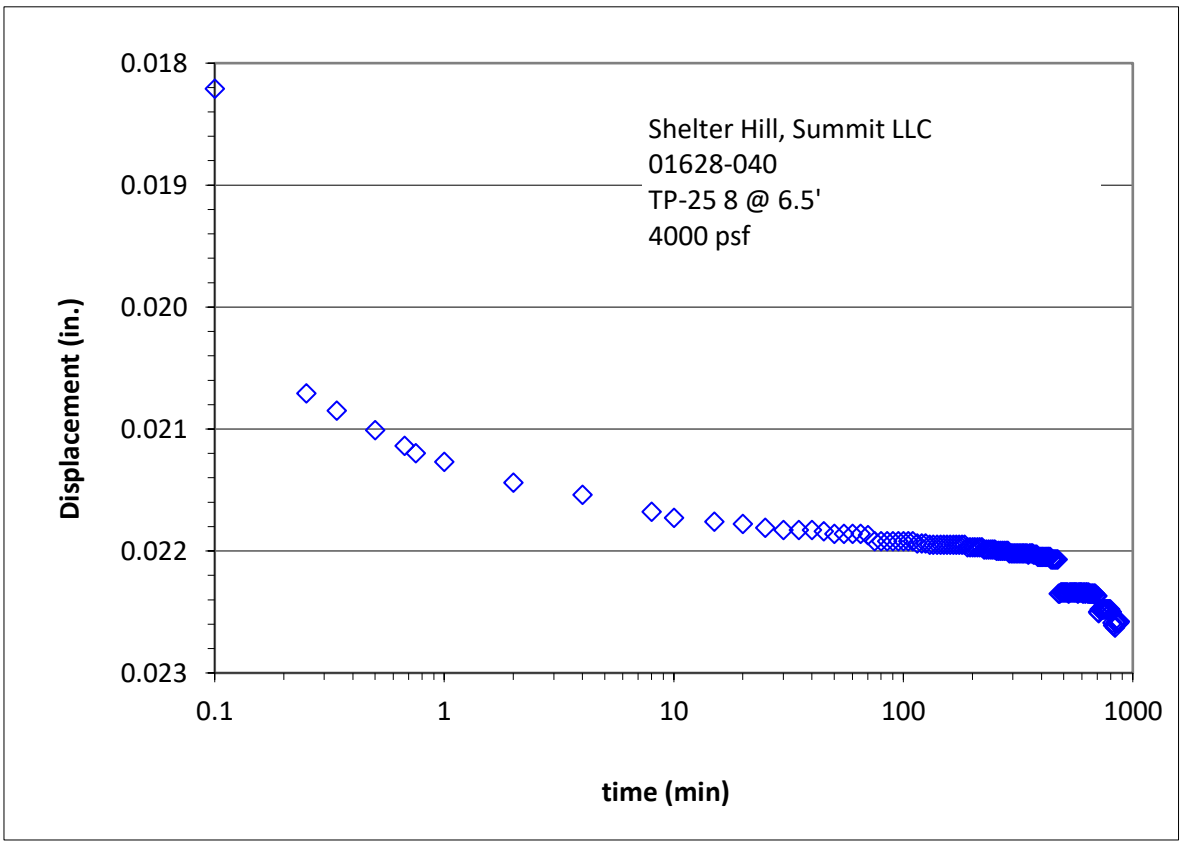
(ASTM D3080)

© IGES 2009, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-25
Station: 8
Depth: 6.5'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

© IGES 2009, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/13/2024
By: PW

Boring No.: TP-9
Station: 24
Depth: 9.0'
Sample Description: Reddish brown sandy clay
Sample type: Laboratory compacted
Dry unit weight 116.5 pcf
at 11.4 (%) w
Compaction specifications: 94% of ASTM D1557B

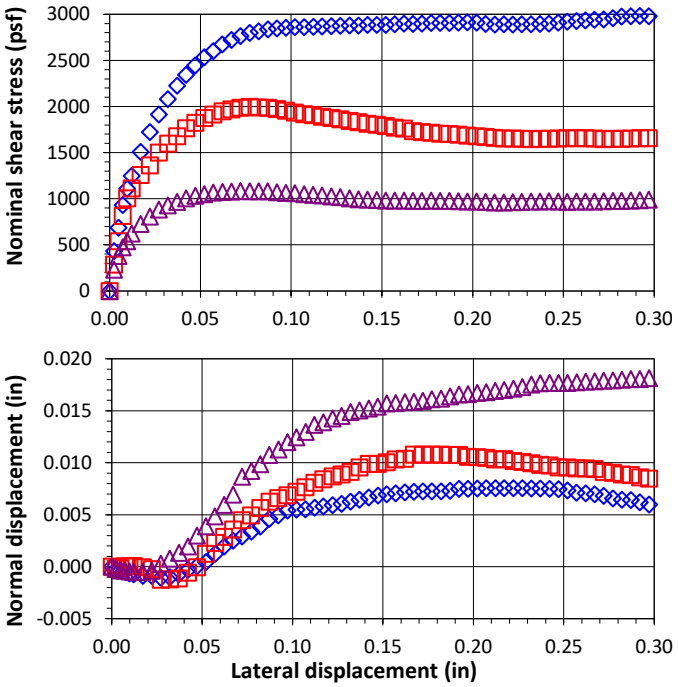
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0043
Specific gravity, Gs: 2.70 Assumed

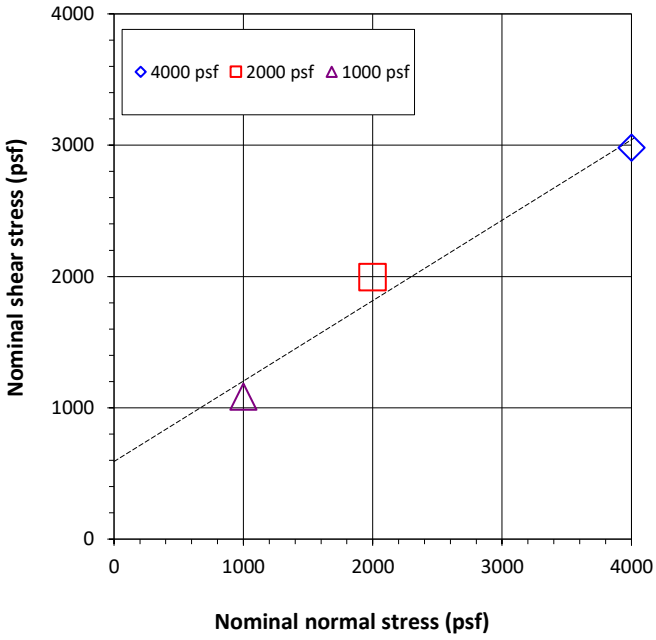
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4000		2000		1000	
Peak shear stress (psf)	2982		1995		1084	
Lateral displacement at peak (in)	0.292		0.077		0.072	
Load Duration (min)	1002		1014		1026	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.004	0.983	1.000	0.982	1.000	0.994
Specimen diameter (in)	2.413	2.413	2.412	2.412	2.412	2.412
Wt. rings + wet soil (g)	201.63	207.39	200.51	206.47	200.51	207.39
Wt. rings (g)	45.21	45.21	44.85	44.85	44.92	44.92
Wet soil + tare (g)	370.35		370.35		370.35	
Dry soil + tare (g)	354.29		354.29		354.29	
Tare (g)	211.97		211.97		211.97	
Water content (%)	11.3	15.4	11.3	15.5	11.3	16.2
Dry unit weight (pcf)	116.6	119.0	116.6	118.7	116.6	117.2
Void ratio, e, for assumed Gs	0.45	0.42	0.45	0.42	0.45	0.44
Saturation (%)*	68.4	100.0	68.4	100.0	68.3	100.0

ϕ' (deg)	31
c' (psf)	591

Average of 3 specimens	Initial	Pre-shear
Water content (%)	11.3	15.7
Dry unit weight (pcf)	116.6	118.3

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens remolded to 94% of maximum dry unit weight at optimum water content using material passing the No. 4 sieve. Test specimens swelled upon inundation and up to and including the 500 psf load step.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-9
Station: 24
Depth: 9.0'

Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	432	0.000	0.002	286	0.000	0.002	231	0.000
0.005	686	0.000	0.005	541	0.000	0.005	378	0.000
0.007	932	-0.001	0.007	813	0.000	0.007	475	0.000
0.010	1108	-0.001	0.010	1003	0.000	0.010	538	0.000
0.012	1248	-0.001	0.012	1112	0.000	0.012	622	-0.001
0.017	1509	-0.001	0.017	1256	0.000	0.017	727	-0.001
0.022	1724	-0.001	0.022	1363	0.000	0.022	808	0.000
0.027	1915	-0.001	0.027	1499	-0.001	0.027	882	0.000
0.032	2081	-0.001	0.032	1597	-0.001	0.032	926	0.001
0.037	2226	-0.001	0.037	1677	-0.001	0.037	968	0.001
0.042	2342	0.000	0.042	1764	-0.001	0.042	1004	0.002
0.047	2443	0.000	0.047	1823	0.000	0.047	1033	0.003
0.052	2536	0.000	0.052	1874	0.001	0.052	1049	0.004
0.057	2601	0.001	0.057	1915	0.002	0.057	1066	0.005
0.062	2674	0.002	0.062	1947	0.003	0.062	1075	0.006
0.067	2723	0.002	0.067	1970	0.004	0.067	1077	0.007
0.072	2764	0.003	0.072	1987	0.004	0.072	1084	0.009
0.077	2798	0.003	0.077	1995	0.005	0.077	1081	0.009
0.082	2816	0.004	0.082	1990	0.006	0.082	1081	0.010
0.087	2837	0.005	0.087	1985	0.006	0.087	1081	0.011
0.092	2847	0.005	0.092	1971	0.007	0.092	1070	0.011
0.097	2855	0.005	0.097	1954	0.007	0.097	1064	0.012
0.102	2862	0.005	0.102	1934	0.007	0.102	1059	0.012
0.107	2862	0.006	0.107	1916	0.008	0.107	1048	0.013
0.112	2865	0.006	0.112	1905	0.008	0.112	1042	0.014
0.117	2868	0.006	0.117	1890	0.008	0.117	1034	0.014
0.122	2870	0.006	0.122	1875	0.009	0.122	1025	0.014
0.127	2873	0.006	0.127	1861	0.009	0.127	1017	0.015
0.132	2878	0.006	0.132	1845	0.009	0.132	1003	0.015
0.137	2878	0.006	0.137	1829	0.010	0.137	995	0.015
0.142	2883	0.007	0.142	1812	0.010	0.142	991	0.015
0.147	2886	0.007	0.147	1801	0.010	0.147	986	0.015
0.152	2886	0.007	0.152	1788	0.010	0.152	980	0.016
0.157	2891	0.007	0.157	1772	0.010	0.157	978	0.016
0.162	2899	0.007	0.162	1759	0.010	0.162	979	0.016
0.167	2896	0.007	0.167	1732	0.011	0.167	976	0.016
0.172	2899	0.007	0.172	1722	0.011	0.172	976	0.016
0.177	2904	0.007	0.177	1715	0.011	0.177	978	0.016
0.182	2906	0.007	0.182	1706	0.011	0.182	976	0.016
0.187	2906	0.007	0.187	1701	0.011	0.187	976	0.016
0.192	2909	0.007	0.192	1694	0.011	0.192	972	0.017
0.197	2912	0.007	0.197	1686	0.011	0.197	970	0.017
0.202	2909	0.008	0.202	1676	0.011	0.202	968	0.017
0.207	2896	0.008	0.207	1669	0.010	0.207	968	0.017
0.212	2888	0.008	0.212	1661	0.010	0.212	959	0.017
0.217	2891	0.008	0.217	1654	0.010	0.217	959	0.017
0.222	2888	0.008	0.222	1653	0.010	0.222	963	0.017
0.227	2891	0.008	0.227	1649	0.010	0.227	966	0.017
0.232	2891	0.008	0.232	1645	0.010	0.232	969	0.018
0.237	2894	0.008	0.237	1649	0.010	0.237	970	0.018
0.242	2899	0.007	0.242	1651	0.010	0.242	973	0.018
0.247	2909	0.007	0.247	1653	0.010	0.247	969	0.018
0.252	2919	0.007	0.252	1657	0.010	0.252	968	0.018
0.257	2927	0.007	0.257	1658	0.009	0.257	970	0.018
0.262	2932	0.007	0.262	1658	0.009	0.262	968	0.018
0.267	2940	0.007	0.267	1652	0.009	0.267	969	0.018
0.272	2945	0.007	0.272	1646	0.009	0.272	974	0.018
0.277	2958	0.007	0.277	1649	0.009	0.277	975	0.018
0.282	2974	0.006	0.282	1649	0.009	0.282	978	0.018
0.287	2979	0.006	0.287	1652	0.009	0.287	981	0.018
0.292	2982	0.006	0.292	1655	0.009	0.292	985	0.018
0.297	2979	0.006	0.297	1658	0.008	0.297	991	0.018

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

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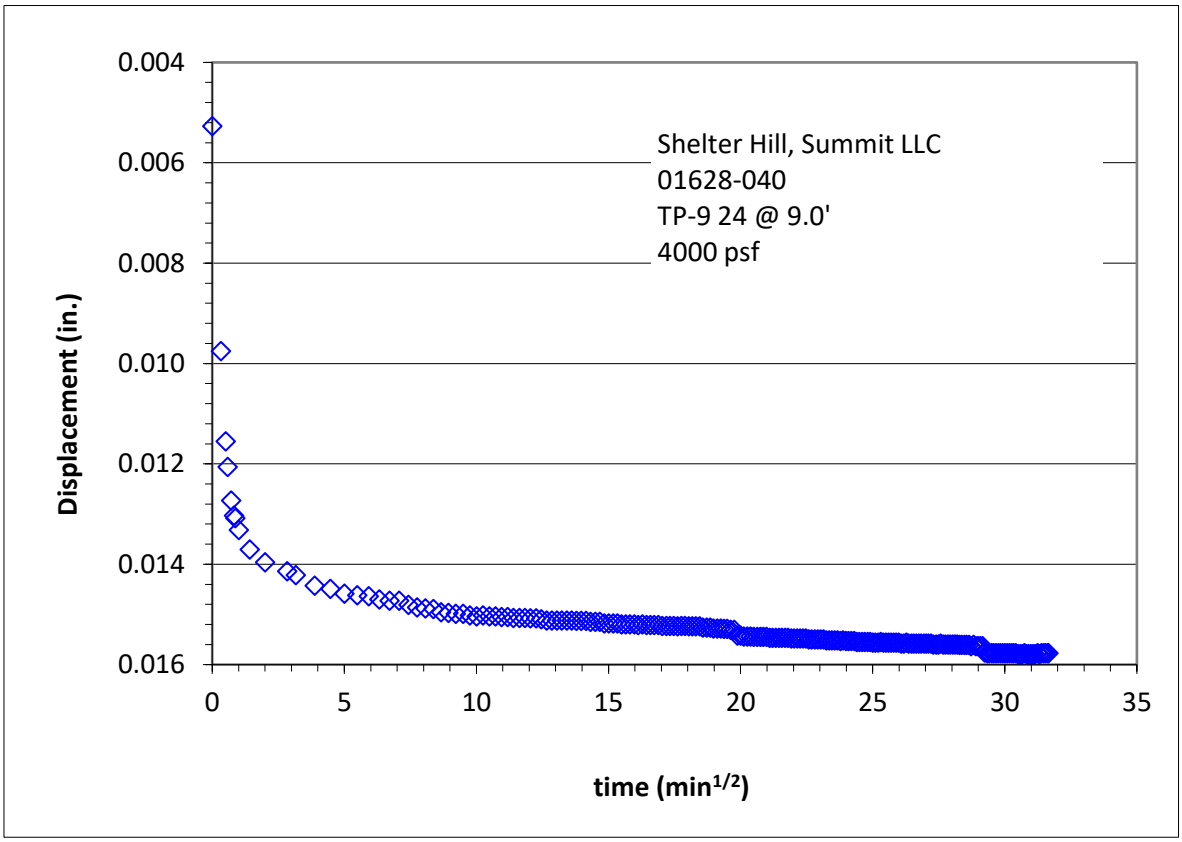
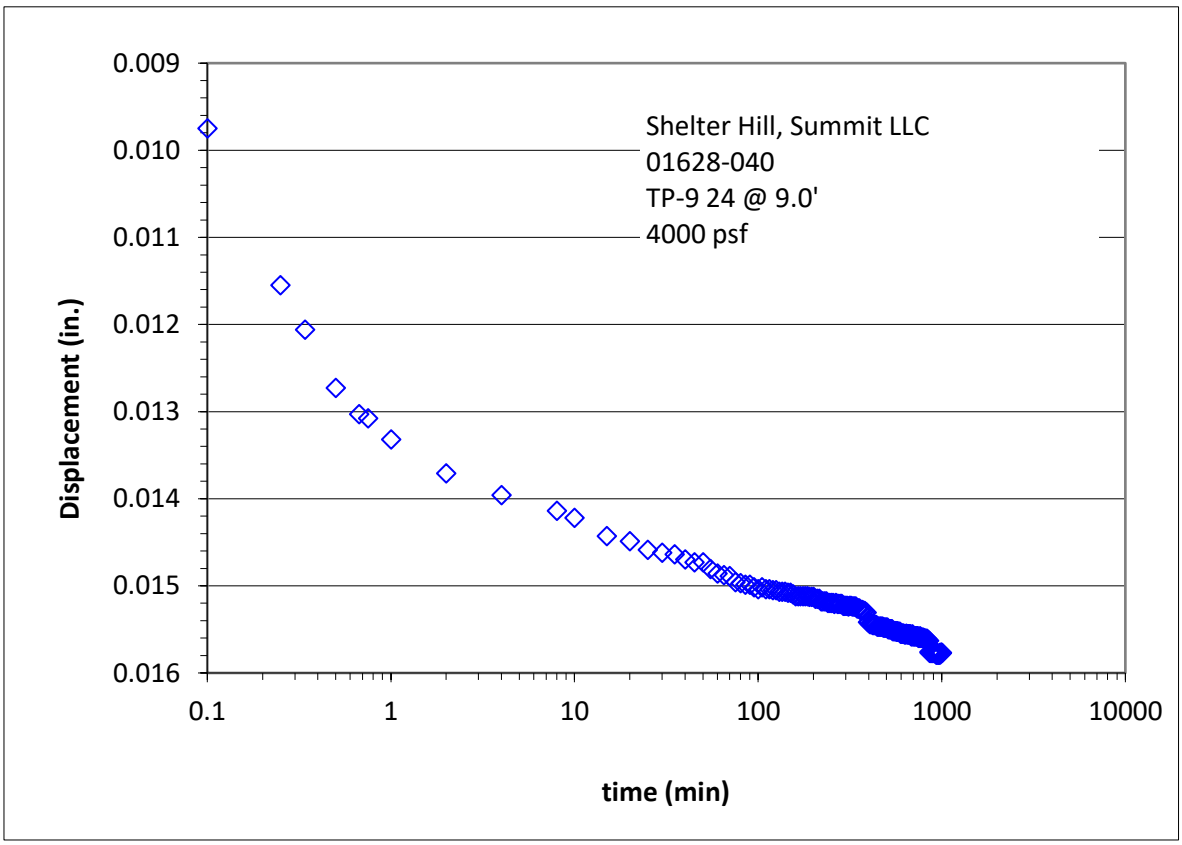
Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-9
Station: 24
Depth: 9.0'





Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

© IGES 2009, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT
Date: 8/12/2024
By: PW

Boring No.: TP-5
Station: 11
Depth: 4.5'
Sample Description: Reddish brown clayey gravel with sand
Sample type: Laboratory compacted
Dry unit weight 116.4 pcf
at 11.0 (%) w
Compaction specifications: 94% of ASTM D1557C

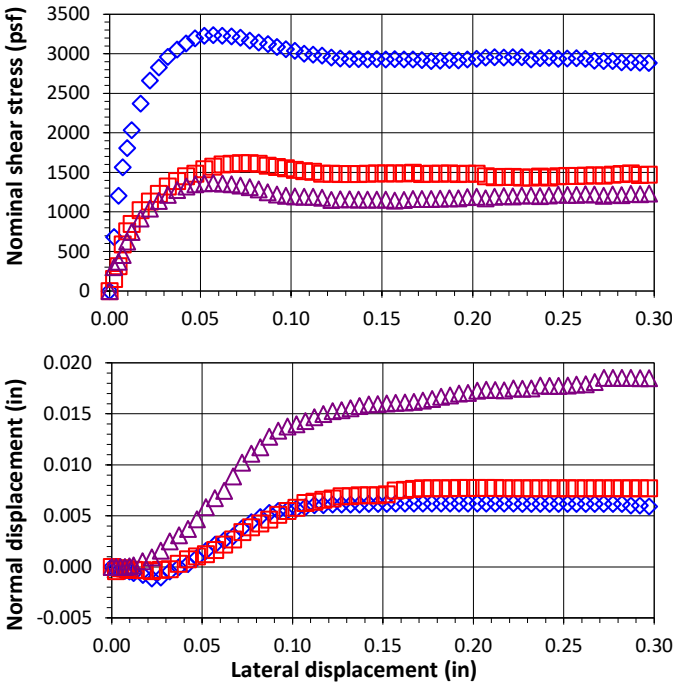
Test type: Inundated
Lateral displacement (in.): 0.3
Shear rate (in./min): 0.0043
Specific gravity, Gs: 2.70 Assumed

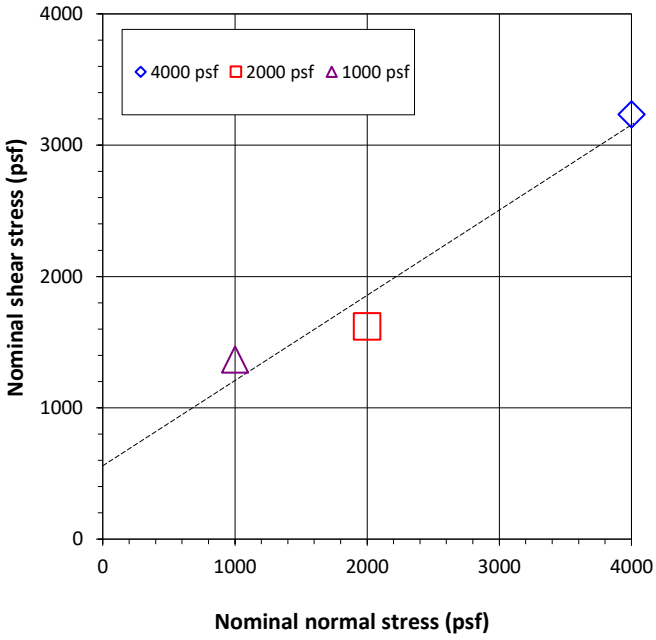
	Specimen 1		Specimen 2		Specimen 3	
Nominal normal stress (psf)	4000		2000		1000	
Peak shear stress (psf)	3235		1618		1367	
Lateral displacement at peak (in)	0.057		0.077		0.057	
Load Duration (min)	3886		3897		3908	
	Initial	Pre-shear	Initial	Pre-shear	Initial	Pre-shear
Specimen height (in)	1.004	0.994	1.001	0.983	1.002	1.001
Specimen diameter (in)	2.413	2.413	2.413	2.413	2.414	2.414
Wt. rings + wet soil (g)	201.76	208.12	198.04	203.75	200.89	207.87
Wt. rings (g)	45.23	45.23	41.98	41.98	44.49	44.49
Wet soil + tare (g)	301.91		301.91		301.91	
Dry soil + tare (g)	283.97		283.97		283.97	
Tare (g)	128.21		128.21		128.21	
Water content (%)	11.5	16.0	11.5	15.6	11.5	16.5
Dry unit weight (pcf)	116.5	117.6	116.5	118.5	116.5	116.6
Void ratio, e, for assumed Gs	0.45	0.43	0.45	0.42	0.45	0.45
Saturation (%)*	69.5	100.0	69.5	100.0	69.6	100.0

ϕ' (deg)	33
c' (psf)	558

Average of 3 specimens	Initial	Pre-shear
Water content (%)	11.5	16.0
Dry unit weight (pcf)	116.5	117.6

*Pre-shear saturation set to 100% for phase calculations





Comments:
Test specimens remolded to 94% of maximum dry unit weight at optimum water content using material passing the No. 4 sieve. Test specimens swelled upon inundation and up to and including the 1000 psf load step.

Entered by:_____
Reviewed:_____

Direct Shear Test for Soils Under Drained Conditions

(ASTM D3080)

© IGES 2009, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-5
Station: 11
Depth: 4.5'

Nominal normal stress = 4000 psf			Nominal normal stress = 2000 psf			Nominal normal stress = 1000 psf		
Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)	Lateral Displacement (in.)	Nominal Shear Stress (psf)	Normal Displacement (in.)
0.000	0	0.000	0.000	0	0.000	0.000	0	0.000
0.002	683	0.000	0.002	154	0.000	0.002	303	0.000
0.005	1206	0.000	0.005	312	0.000	0.005	369	0.000
0.007	1564	0.000	0.007	588	0.000	0.007	454	0.000
0.010	1807	0.000	0.010	755	0.000	0.010	624	0.000
0.012	2035	-0.001	0.012	849	0.000	0.012	747	0.000
0.017	2371	-0.001	0.017	1022	0.000	0.017	916	0.001
0.022	2661	-0.001	0.022	1132	0.000	0.022	1043	0.001
0.027	2826	-0.001	0.027	1229	0.000	0.027	1138	0.002
0.032	2961	0.000	0.032	1320	0.000	0.032	1218	0.002
0.037	3054	0.000	0.037	1390	0.000	0.037	1278	0.003
0.042	3132	0.000	0.042	1451	0.001	0.042	1323	0.004
0.047	3194	0.001	0.047	1482	0.001	0.047	1352	0.005
0.052	3228	0.002	0.052	1541	0.001	0.052	1364	0.006
0.057	3235	0.002	0.057	1572	0.002	0.057	1367	0.007
0.062	3230	0.003	0.062	1599	0.002	0.062	1360	0.007
0.067	3220	0.003	0.067	1608	0.003	0.067	1350	0.009
0.072	3202	0.004	0.072	1615	0.003	0.072	1335	0.010
0.077	3168	0.004	0.077	1618	0.004	0.077	1314	0.011
0.082	3142	0.005	0.082	1607	0.004	0.082	1285	0.012
0.087	3121	0.005	0.087	1586	0.005	0.087	1249	0.013
0.092	3085	0.005	0.092	1569	0.005	0.092	1221	0.013
0.097	3059	0.006	0.097	1551	0.005	0.097	1204	0.014
0.102	3036	0.006	0.102	1532	0.006	0.102	1198	0.014
0.107	3002	0.006	0.107	1517	0.006	0.107	1194	0.014
0.112	2990	0.006	0.112	1507	0.006	0.112	1191	0.015
0.117	2977	0.006	0.117	1483	0.007	0.117	1180	0.015
0.122	2953	0.006	0.122	1483	0.007	0.122	1151	0.015
0.127	2940	0.006	0.127	1481	0.007	0.127	1159	0.015
0.132	2933	0.006	0.132	1480	0.007	0.132	1161	0.016
0.137	2933	0.006	0.137	1481	0.007	0.137	1157	0.016
0.142	2930	0.006	0.142	1485	0.007	0.142	1157	0.016
0.147	2933	0.006	0.147	1486	0.007	0.147	1156	0.016
0.152	2930	0.006	0.152	1489	0.007	0.152	1157	0.016
0.157	2933	0.006	0.157	1486	0.007	0.157	1145	0.016
0.162	2930	0.006	0.162	1486	0.008	0.162	1153	0.016
0.167	2927	0.006	0.167	1495	0.008	0.167	1163	0.016
0.172	2920	0.006	0.172	1480	0.008	0.172	1166	0.016
0.177	2909	0.006	0.177	1482	0.008	0.177	1163	0.016
0.182	2914	0.006	0.182	1482	0.008	0.182	1167	0.017
0.187	2922	0.006	0.187	1488	0.008	0.187	1171	0.017
0.192	2917	0.006	0.192	1481	0.008	0.192	1174	0.017
0.197	2927	0.006	0.197	1484	0.008	0.197	1190	0.017
0.202	2938	0.006	0.202	1484	0.008	0.202	1191	0.017
0.207	2951	0.006	0.207	1452	0.008	0.207	1173	0.017
0.212	2956	0.006	0.212	1439	0.008	0.212	1192	0.017
0.217	2953	0.006	0.217	1444	0.008	0.217	1201	0.017
0.222	2956	0.006	0.222	1442	0.008	0.222	1196	0.017
0.227	2958	0.006	0.227	1435	0.008	0.227	1209	0.017
0.232	2927	0.006	0.232	1436	0.008	0.232	1207	0.017
0.237	2946	0.006	0.237	1448	0.008	0.237	1201	0.018
0.242	2948	0.006	0.242	1435	0.008	0.242	1210	0.018
0.247	2935	0.006	0.247	1453	0.008	0.247	1220	0.018
0.252	2940	0.006	0.252	1457	0.008	0.252	1217	0.018
0.257	2943	0.006	0.257	1456	0.008	0.257	1218	0.018
0.262	2938	0.006	0.262	1461	0.008	0.262	1223	0.018
0.267	2914	0.006	0.267	1462	0.008	0.267	1219	0.018
0.272	2909	0.006	0.272	1461	0.008	0.272	1204	0.019
0.277	2907	0.006	0.277	1472	0.008	0.277	1221	0.019
0.282	2891	0.006	0.282	1478	0.008	0.282	1213	0.019
0.287	2891	0.006	0.287	1489	0.008	0.287	1228	0.019
0.292	2889	0.006	0.292	1469	0.008	0.292	1226	0.018
0.297	2883	0.006	0.297	1471	0.008	0.297	1234	0.018

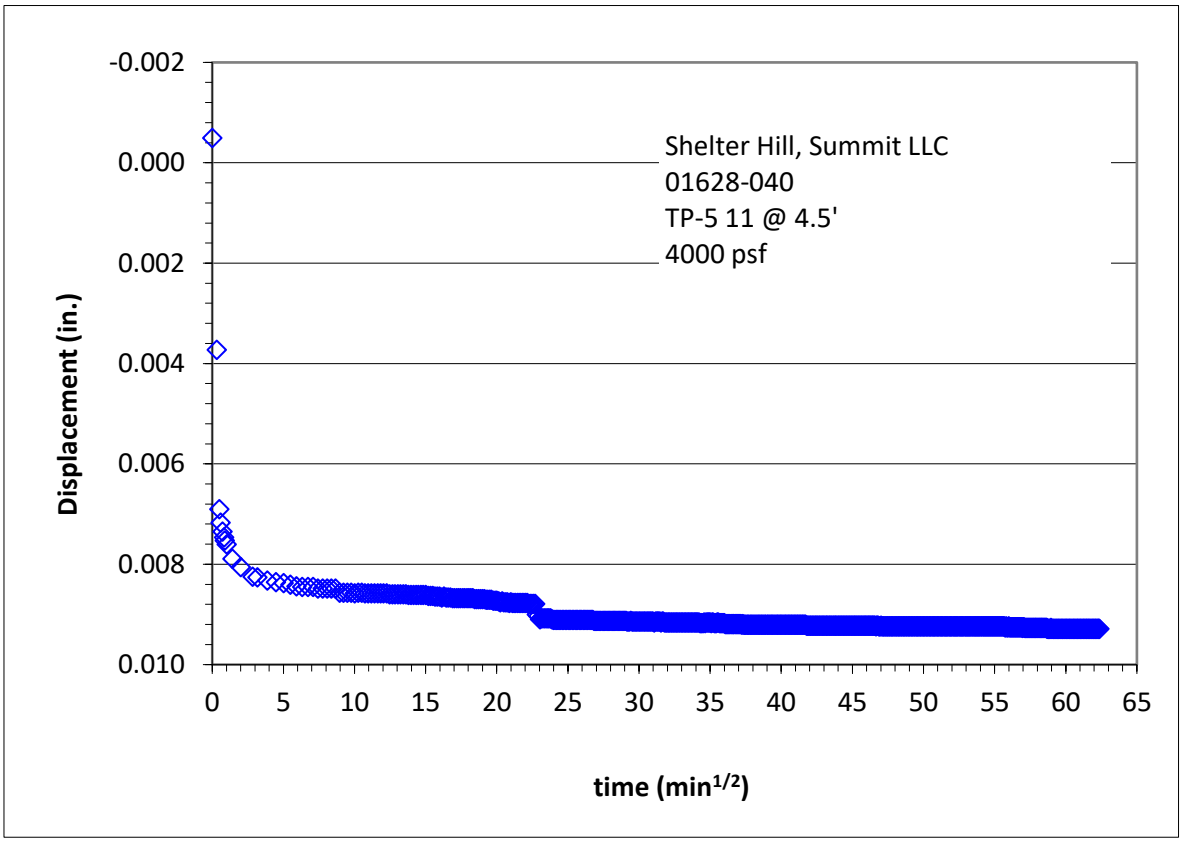
Direct Shear Test for Soils Under Drained Conditions

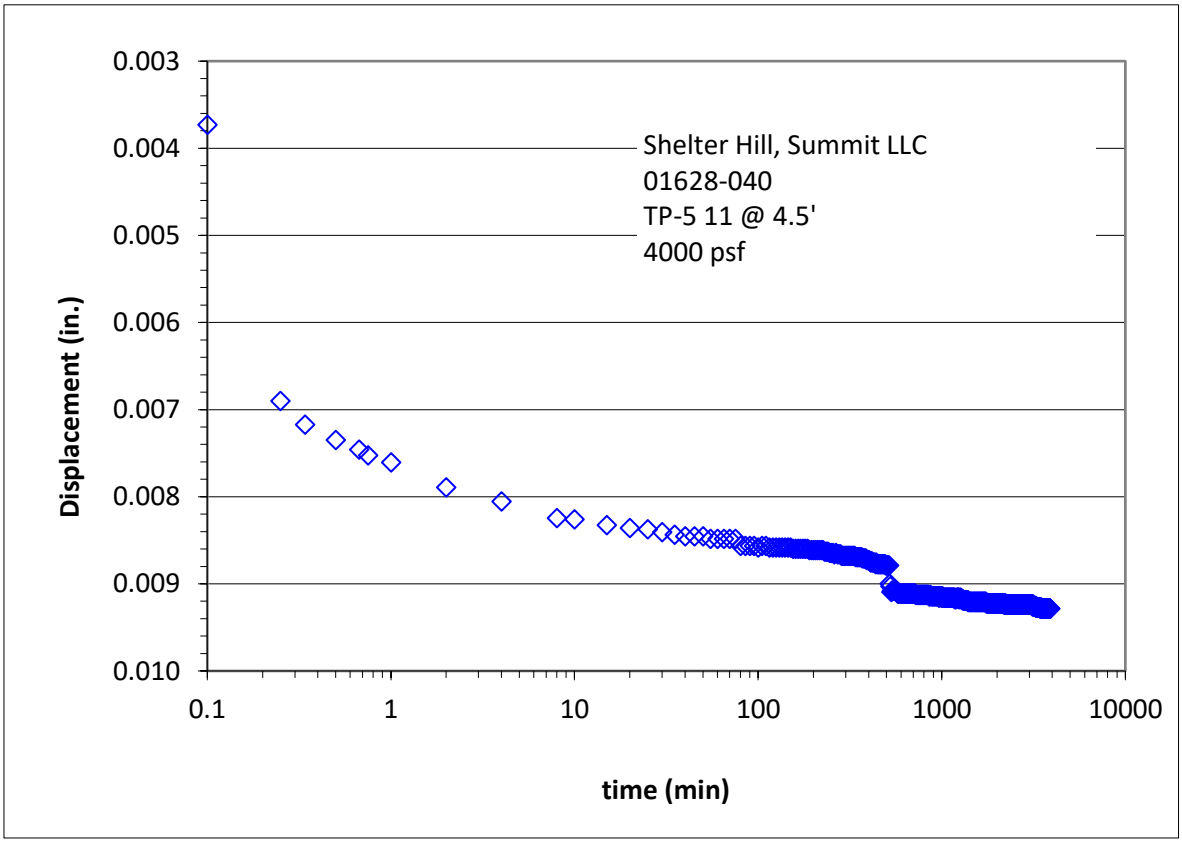
(ASTM D3080)

© IGES 2009, 2024

Project: Shelter Hill, Summit LLC
No: 01628-040
Location: Powder Mountain, UT

Boring No.: TP-5
Station: 11
Depth: 4.5'



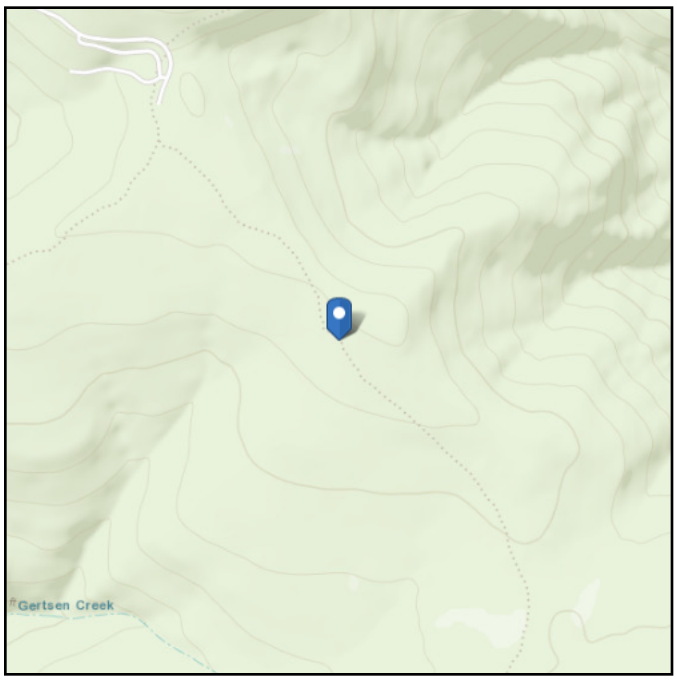


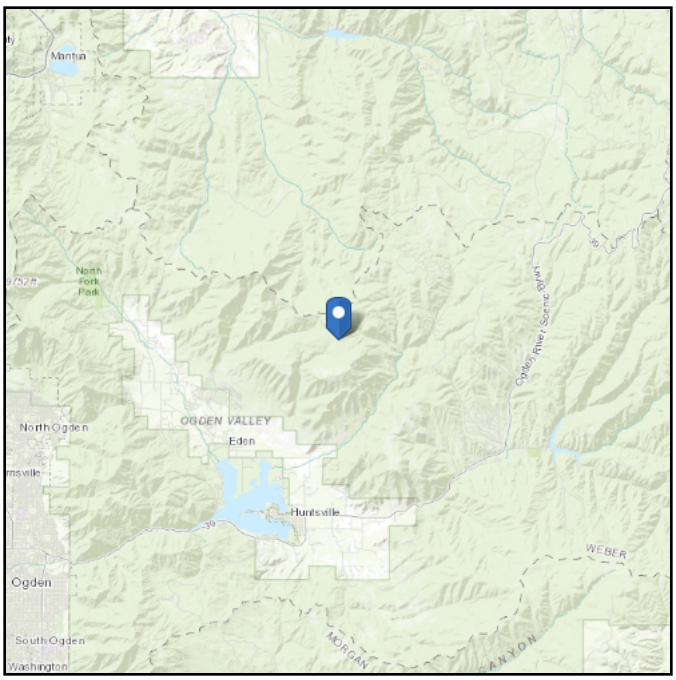
APPENDIX C

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-16	**Latitude:**	41.3555
Risk Category:	II	**Longitude:**	-111.738
Soil Class:	C - Very Dense Soil and Soft Rock	**Elevation:**	8528.059784256171 ft (NAVD 88)





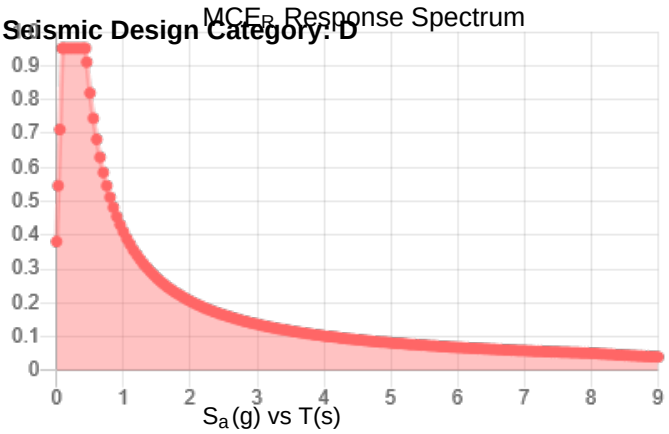
Seismic

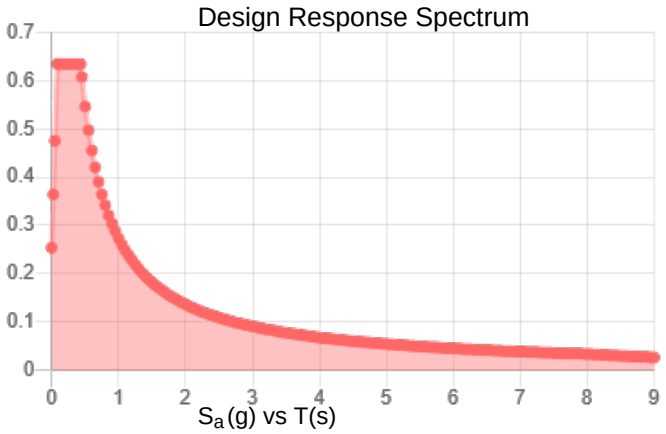
Site Soil Class: C - Very Dense Soil and Soft Rock

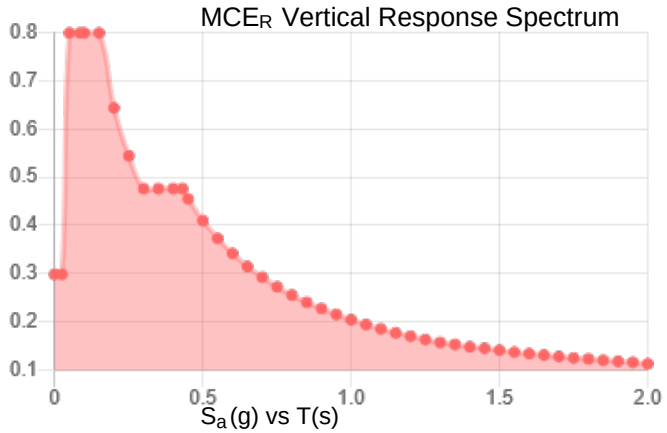
Results:

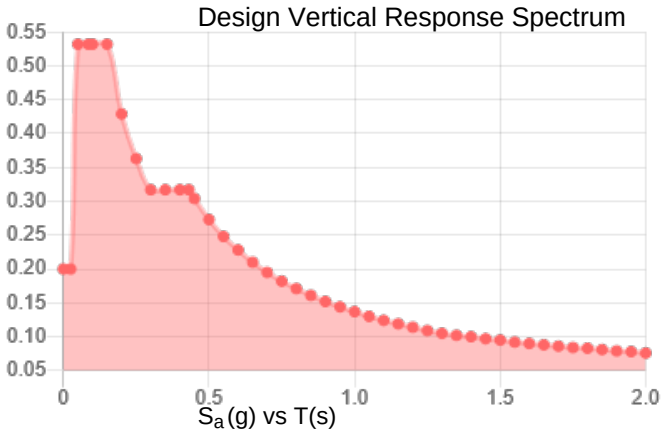
S_S :	0.793	S_{D1} :	0.273
S_1 :	0.273	T_L :	8
F_a :	1.2	PGA :	0.345
F_v :	1.5	PGA_M :	0.414
S_{MS} :	0.952	F_{PGA} :	1.2
S_{M1} :	0.41	I_e :	1
S_{DS} :	0.634	C_v :	1.048

Seismic Design Category: D









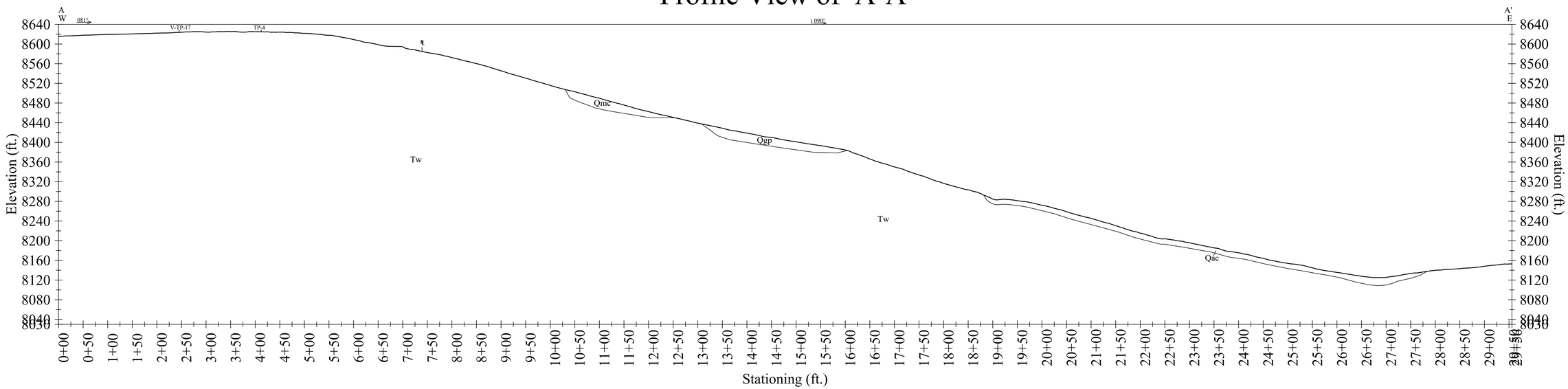
Data Accessed: Thu Oct 03 2024

Date Source:

USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

APPENDIX D

Profile View of A-A'



Topo Data:

-State of Utah and Partners, 2019, Regional Utah high-resolution lidar data 2015 - 2017: Collected by Quantum Spatial, Inc., Digital Mapping, Inc., and Aero-Graphics, Inc. and distributed by OpenTopography, https://doi.org/10.5069/G9RV0KSQ.. Accessed: 2024-06-19

Legend

- Qmc — Undivided Mass-Movement and Colluvial Deposits (Holocene to middle Pliestocene)
- Qgp — Glacial Deposits, Undivided (Late Pleistocene)
- Qac — Undivided Alluvium and Colluvium (Holocene to late Pleistocene)
- Tw — Wasatch Formation (Eocene to Paleocene)
- TP-4 — Test Pit (This Study)
- V-TP-17 — Test Pit (IGES, 2023)
- ℄ — Property Line

0 100 200
FEET
1" = 100'

No Vertical Exaggeration

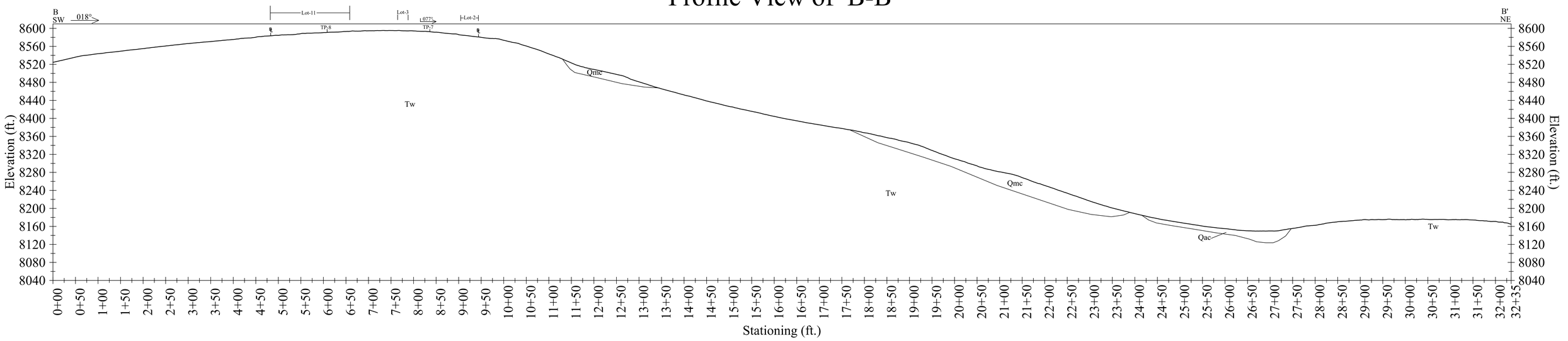
IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Cross Section A-A'

Figure D-1

Profile View of B-B'



Topo Data:

-State of Utah and Partners, 2019, Regional Utah high-resolution lidar data 2015 - 2017: Collected by Quantum Spatial, Inc., Digital Mapping, Inc., and Aero-Graphics, Inc. and distributed by OpenTopography, https://doi.org/10.5069/G9RV0KSQ.. Accessed: 2024-06-19

Legend

- Qmc — Undivided Mass-Movement and Colluvial Deposits (Holocene to middle Pliestocene)
- Qac — Undivided Alluvium and Colluvium (Holocene to late Pleistocene)
- Tw — Wasatch Formation (Eocene to Paleocene)
- TP-8 — Test Pit (This Study)
- ℄ — Property Line

0 100 200
FEET
1" = 100'

No Vertical Exaggeration

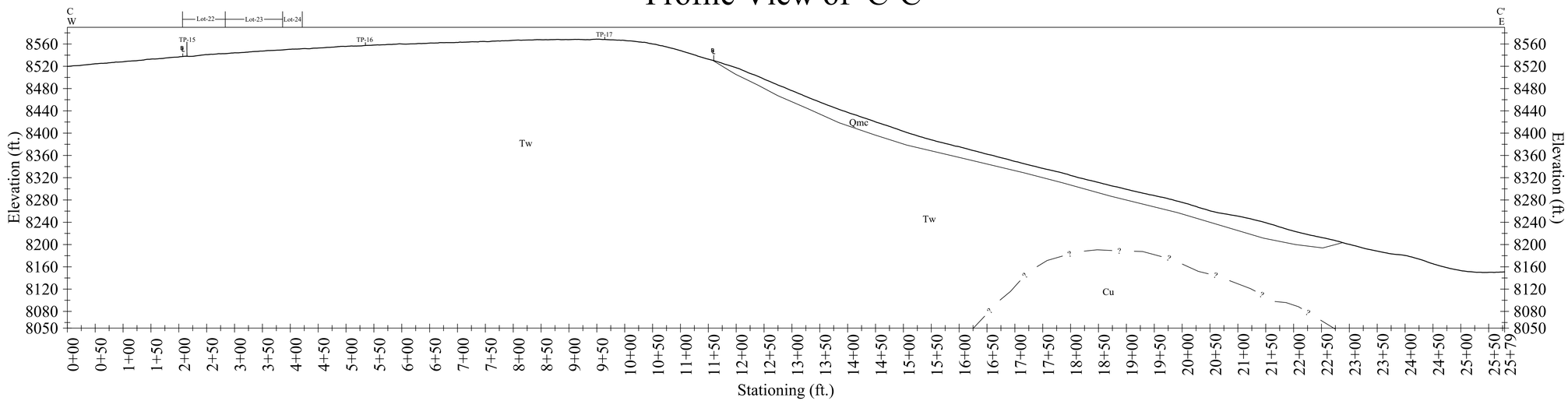
IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Cross Section B-B'

Figure D-2

Profile View of C-C'



Topo Data:

-State of Utah and Partners, 2019, Regional Utah high-resolution lidar data 2015 - 2017: Collected by Quantum Spatial, Inc., Digital Mapping, Inc., and Aero-Graphics, Inc. and distributed by OpenTopography, https://doi.org/10.5069/G9RV0KSQ.. Accessed: 2024-06-19

Legend

- Qmc — Undivided Mass-Movement and Colluvial Deposits (Holocene to middle Pliestocene)
- Tw — Wasatch Formation (Eocene to Paleocene)
- Cu — Ute Formation (Middle Cambrian)
- TP-17 — Test Pit (This Study)
- Property Line

0 100 200
FEET
1" = 100'

No Vertical Exaggeration

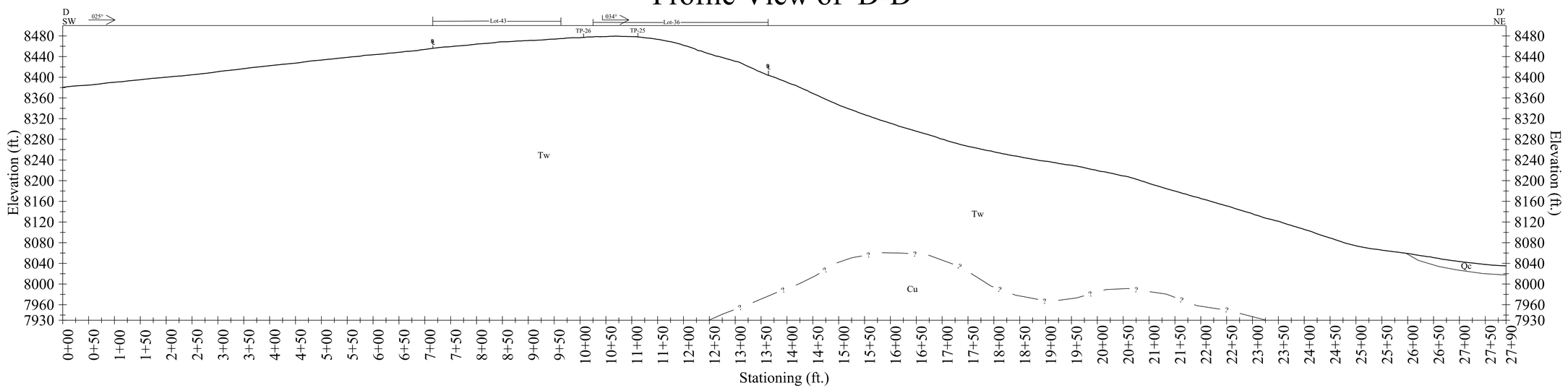
IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Cross Section C-C'

Figure D-3

Profile View of D-D'



Topo Data:

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Legend

- Qc — Colluvial Deposits (Holocene to late Pleistocene)
- Qmc — Undivided Mass-Movement and Colluvial Deposits (Holocene to middle Pliestocene)
- Tw — Wasatch Formation (Eocene to Paleocene)
- TP-26 — Test Pit (This Study)
- Property Line

0 100 200
FEET
1" = 100'

No Vertical Exaggeration

IGES
Project No: 01628-040

Geotechnical and Geologic Hazard Study
Shelter Hill Development
Powder Mountain Resort
Weber County, Utah

Cross Section D-D'

Figure D-4

Powder Mtn./Shelter Hill
04271-001
10/3/2024

c'	150	psf	Effective Cohesion
ϕ'	30	deg	Effective Friction Angle
Y_{sat}	135	pcf	Saturated Unit Weight of Soil
Y_w	62.4	pcf	Unit weight of water
h	4	ft	Depth to shear surface
β	28.0	deg	Slope Gradient (3.6H:1V)

FS 1.25

Input Variable
Calculated Value

This model assumes c>0 and the face of the slope is saturated to depth h

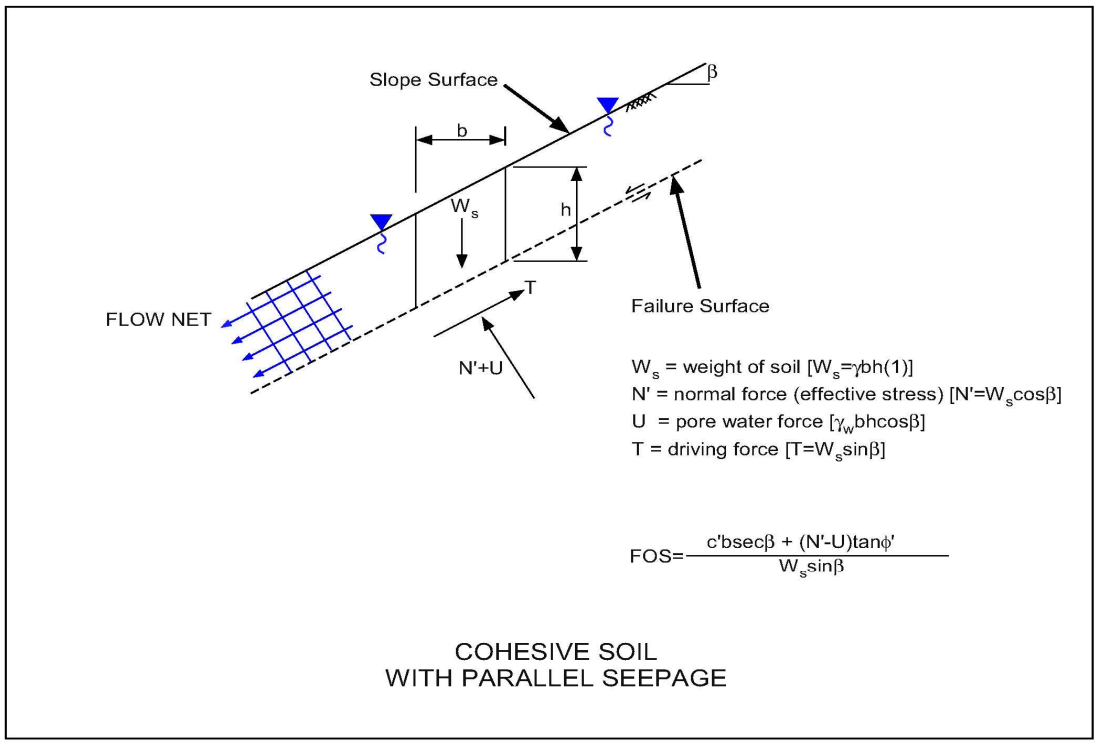
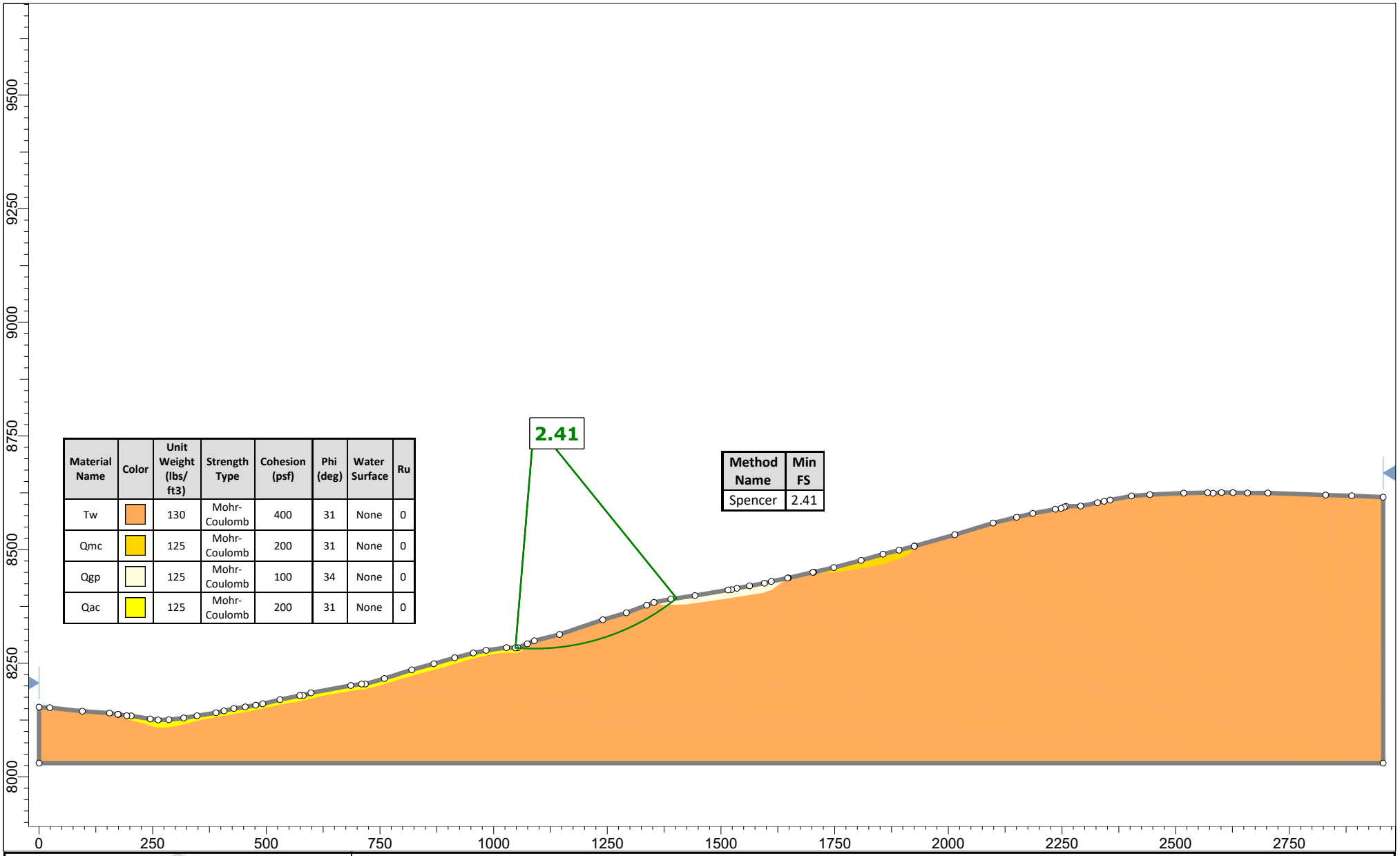


Figure D-5

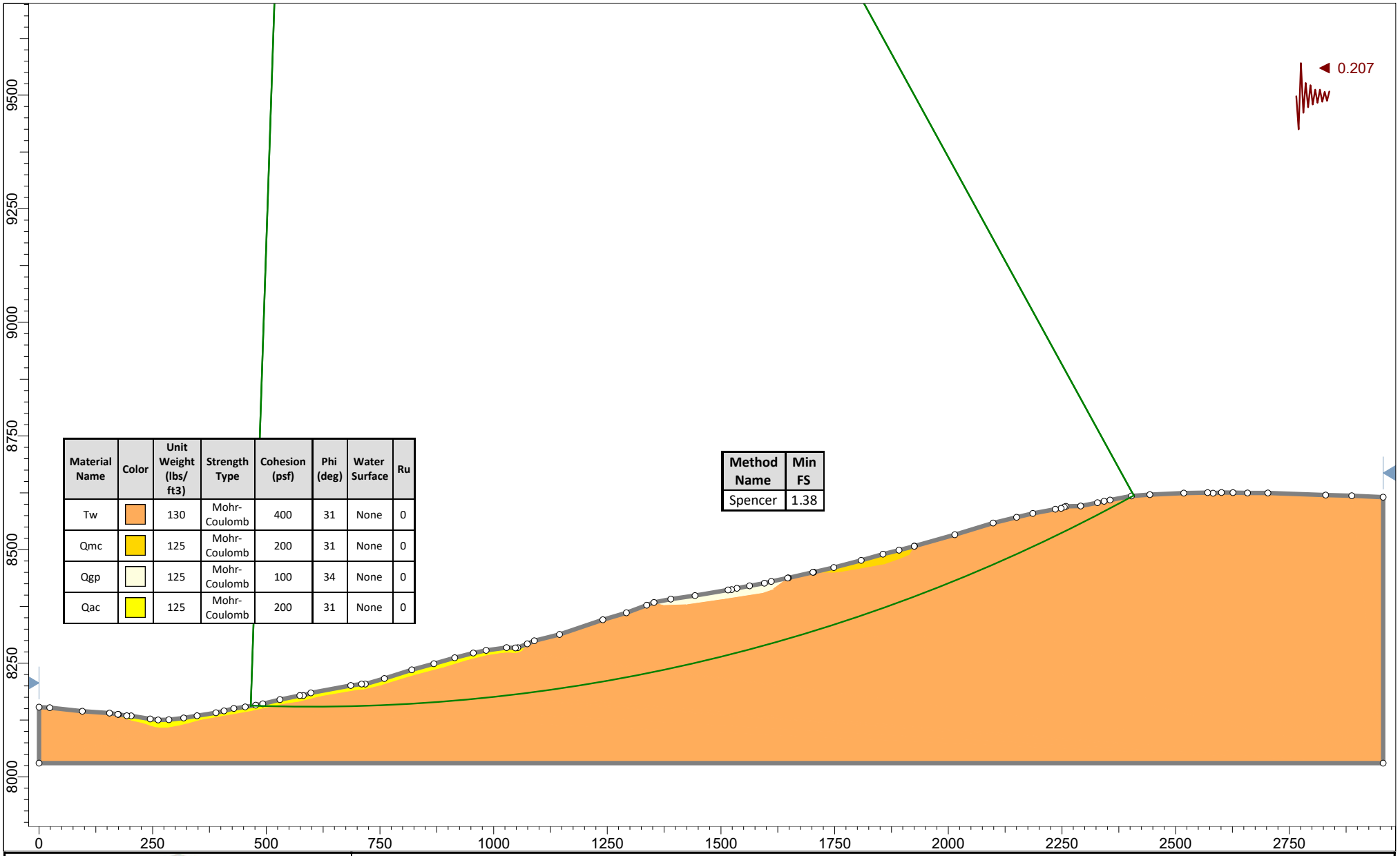


Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Tw		130	Mohr-Coulomb	400	31	None	0
Qmc		125	Mohr-Coulomb	200	31	None	0
Qgp		125	Mohr-Coulomb	100	34	None	0
Qac		125	Mohr-Coulomb	200	31	None	0

Method Name	Min FS
Spencer	2.41

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	A-A'	*Scenario*	Static
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

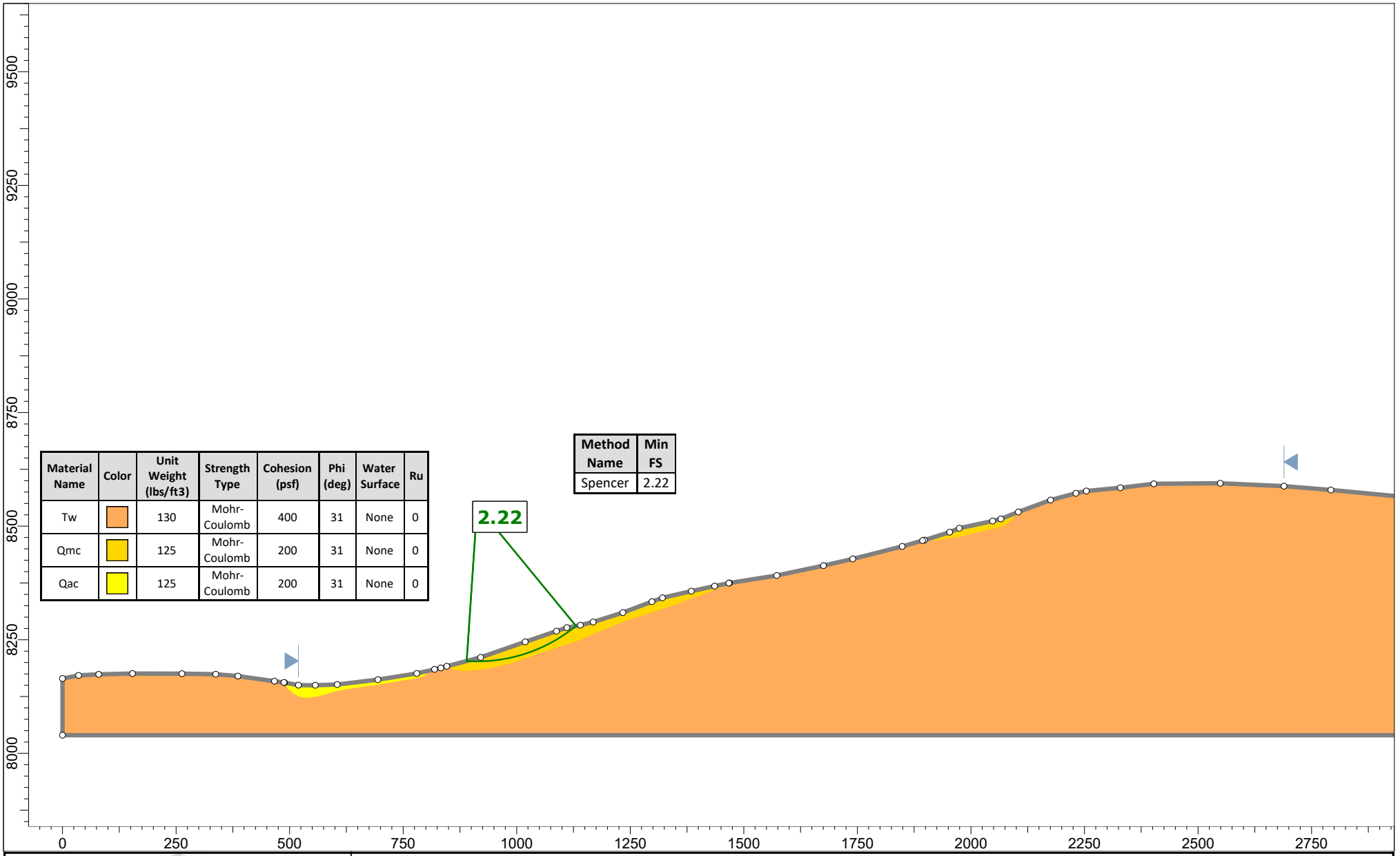


Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Tw		130	Mohr-Coulomb	400	31	None	0
Qmc		125	Mohr-Coulomb	200	31	None	0
Qgp		125	Mohr-Coulomb	100	34	None	0
Qac		125	Mohr-Coulomb	200	31	None	0

Method Name	Min FS
Spencer	1.38

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	A-A'	*Scenario*	Seismic
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

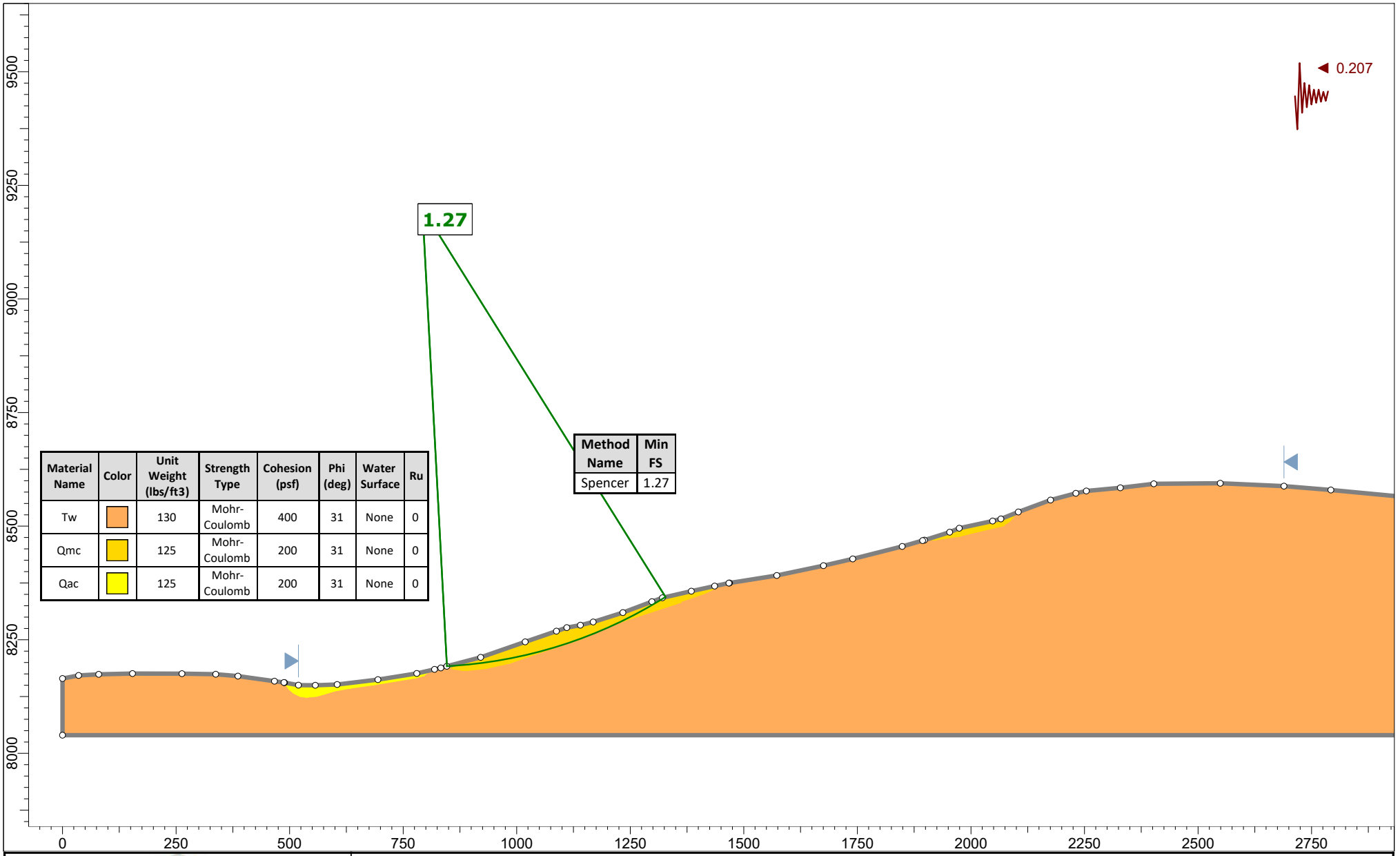


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Tw		130	Mohr-Coulomb	400	31	None	0
Qmc		125	Mohr-Coulomb	200	31	None	0
Qac		125	Mohr-Coulomb	200	31	None	0

Method Name	Min FS
Spencer	2.22

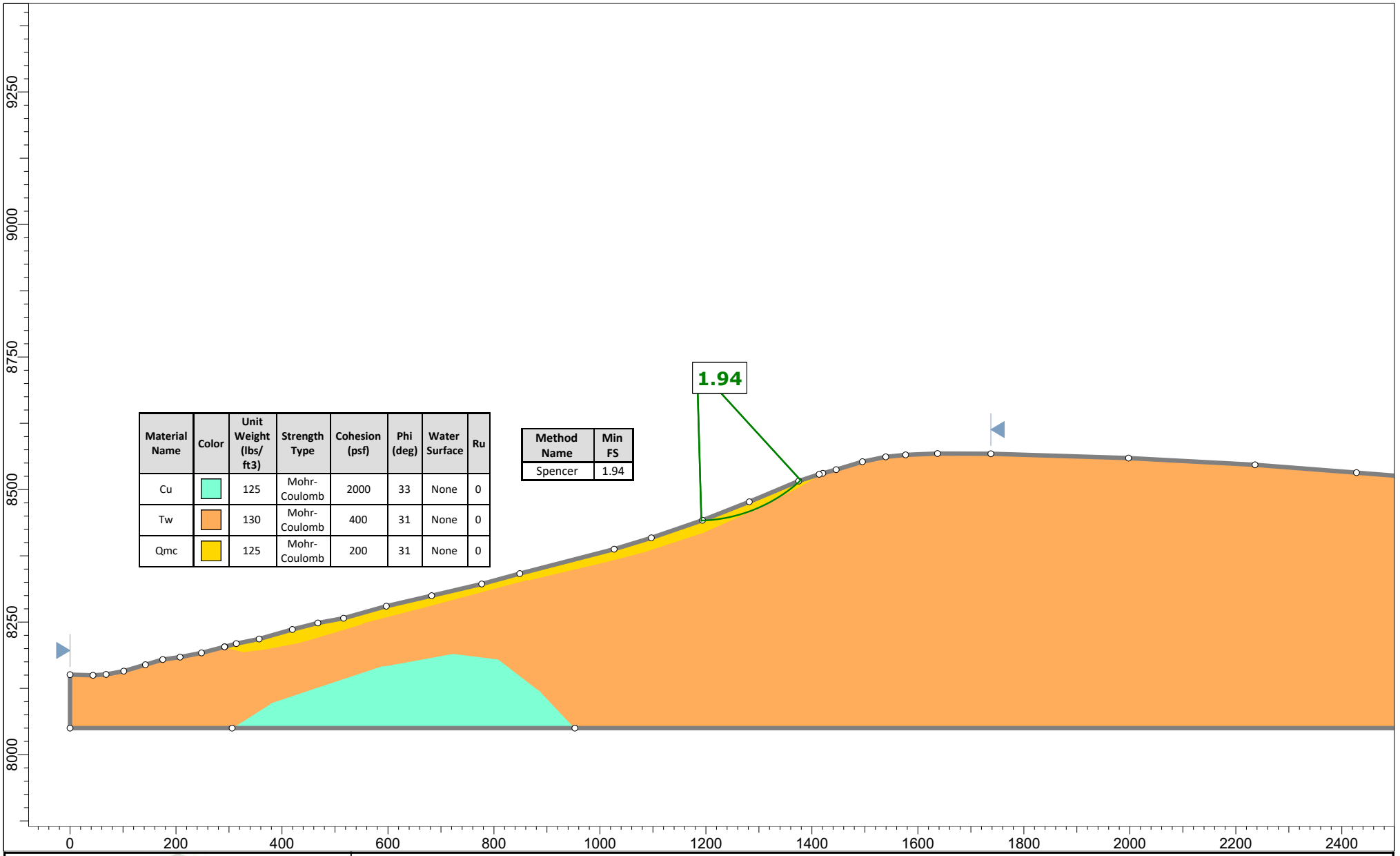
SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	B-B'	*Scenario*	Static
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd



SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	B-B'	*Scenario*	Seismic
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

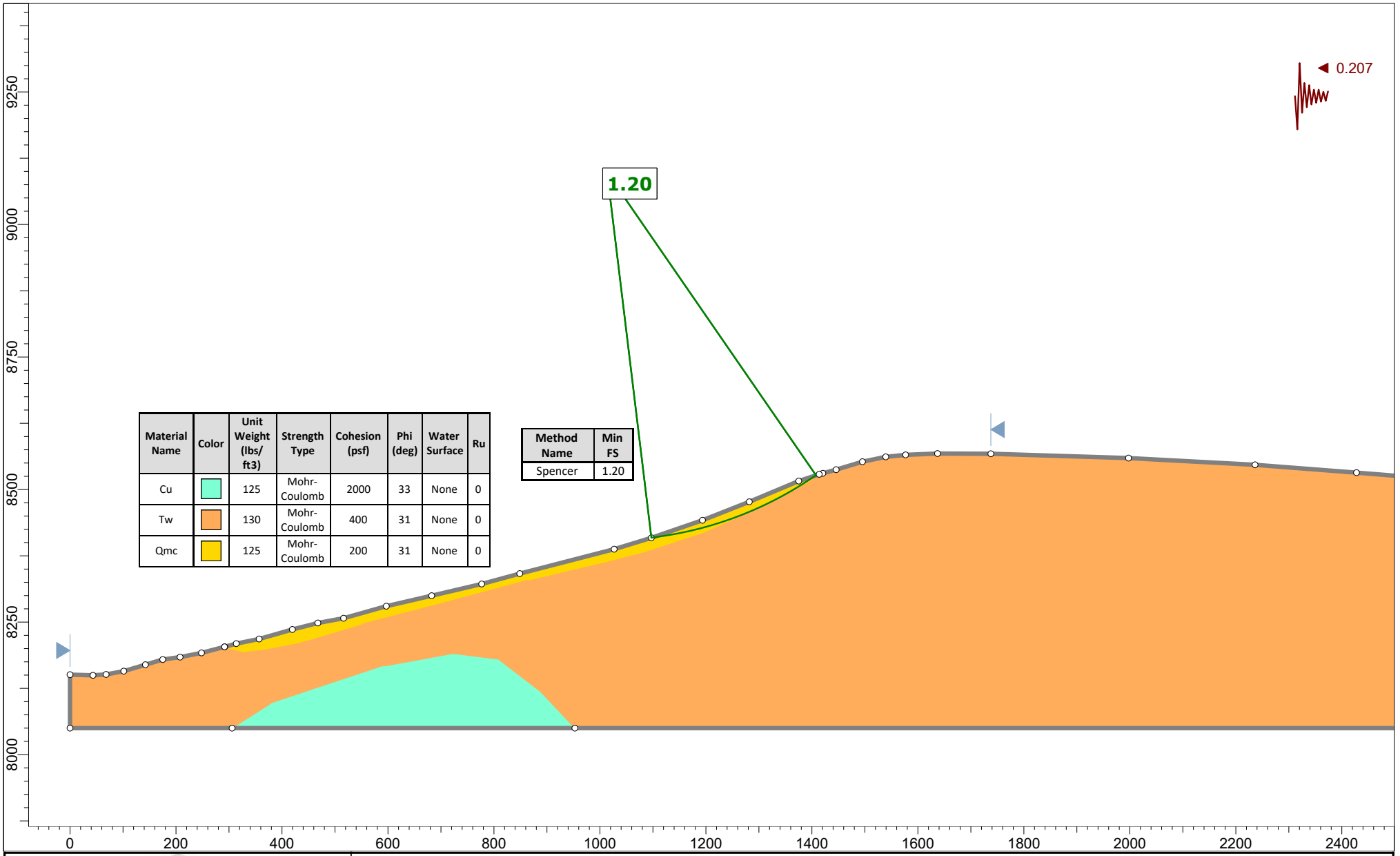


Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Cu		125	Mohr-Coulomb	2000	33	None	0
Tw		130	Mohr-Coulomb	400	31	None	0
Qmc		125	Mohr-Coulomb	200	31	None	0

Method Name	Min FS
Spencer	1.94

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	C-C'	*Scenario*	Static
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

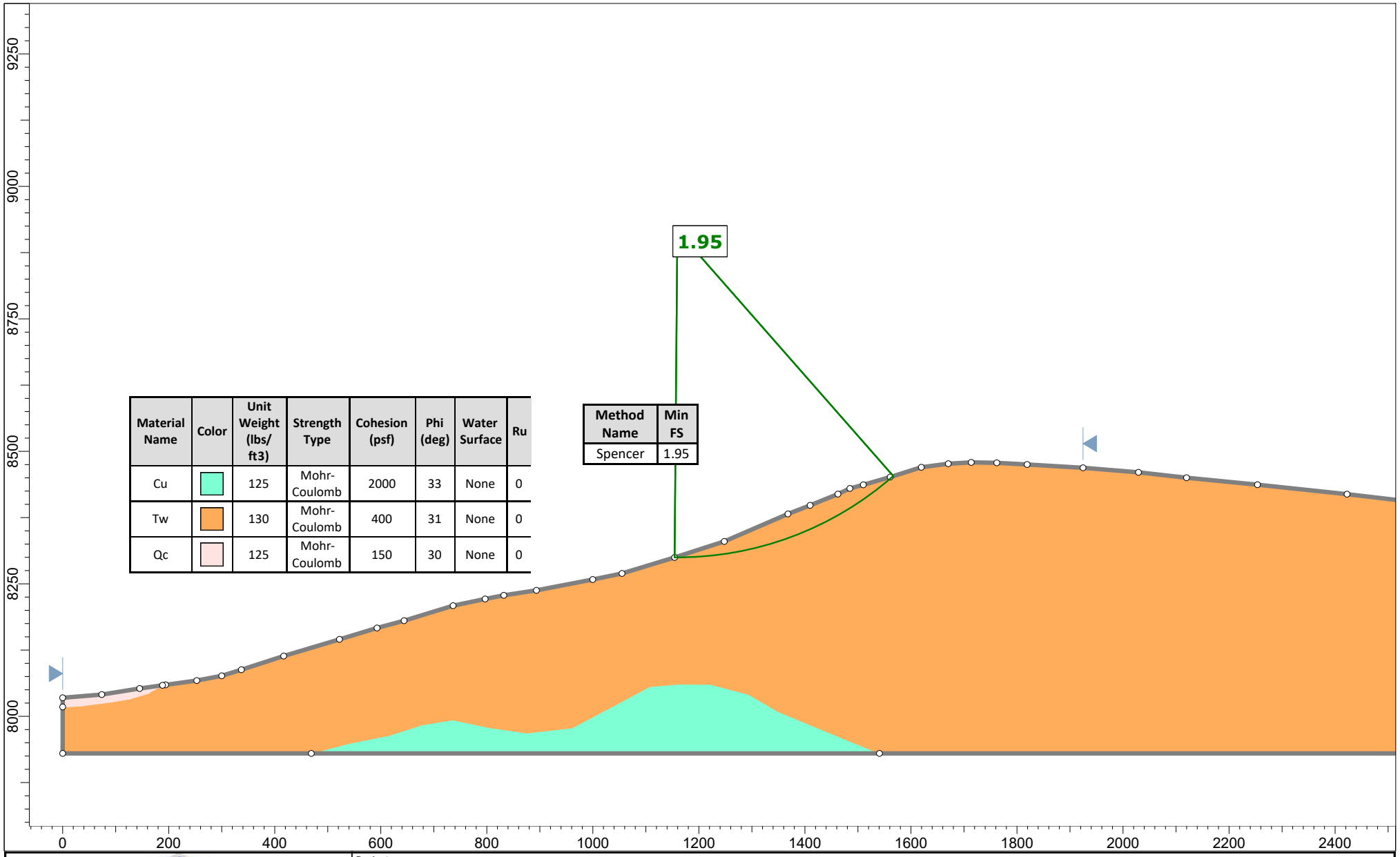


Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Cu		125	Mohr-Coulomb	2000	33	None	0
Tw		130	Mohr-Coulomb	400	31	None	0
Qmc		125	Mohr-Coulomb	200	31	None	0

Method Name	Min FS
Spencer	1.20

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	C-C'	*Scenario*	Seismic
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

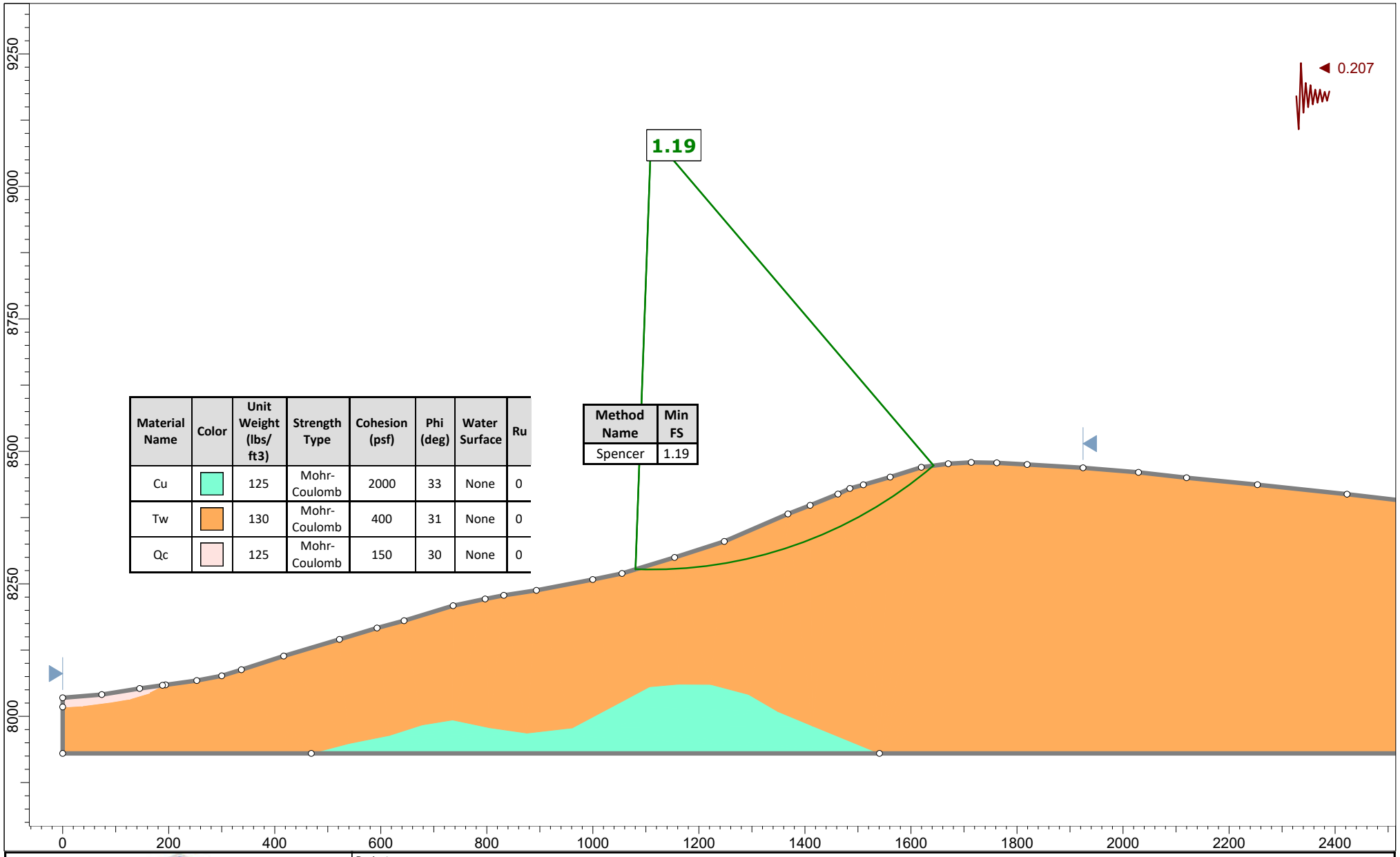


Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Cu		125	Mohr-Coulomb	2000	33	None	0
Tw		130	Mohr-Coulomb	400	31	None	0
Qc		125	Mohr-Coulomb	150	30	None	0

Method Name	Min FS
Spencer	1.95

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	D-D'	*Scenario*	Seismic
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd



Material Name	Color	Unit Weight (lbs/ ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Cu		125	Mohr-Coulomb	2000	33	None	0
Tw		130	Mohr-Coulomb	400	31	None	0
Qc		125	Mohr-Coulomb	150	30	None	0

Method Name	Min FS
Spencer	1.19

SLIDEINTERPRET 9.018

Project	Powder Mtn. - Shelter Hill		
Group	D-D'	*Scenario*	Seismic
Drawn By	DAG	*Company*	IGES Inc.
Date	10-03-24	*File Name*	Shelter Hill.slmd

Shelter Hill
Powder Mtn. - Shelter Hill
IGES Inc.
Date Created: 10-03-24
Software Version: 9.018

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Slide Analysis Information

Shelter Hill

Project Summary

File Name:	Shelter Hill.slmd
Slide Modeler Version:	9.018
Project Title:	Powder Mtn. - Shelter Hill
Analysis:	Section D-D' Seismic
Author:	DAG
Company:	IGES Inc.
Date Created:	10-03-24

Comments

01628-040

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
A-A'	Static	Spencer: 2.413890	00h:00m:00.412s
	Seismic	Spencer: 1.379490	00h:00m:00.305s
B-B'	Static	Spencer: 2.216490	00h:00m:00.354s
	Seismic	Spencer: 1.272220	00h:00m:00.362s
C-C'	Static	Spencer: 1.942630	00h:00m:00.353s
	Seismic	Spencer: 1.195580	00h:00m:00.344s
D-D'	Seismic	Spencer: 1.946090	00h:00m:00.391s
	Seismic	Spencer: 1.186350	00h:00m:00.340s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

A-A' - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

A-A' - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.207

B-B' - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

B-B' - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.207

C-C' - Static

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

C-C' - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.207

D-D' - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

D-D' - Seismic

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.207

Materials

Cu	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	2000
Friction Angle [deg]	33
Water Surface	Assigned per scenario
Ru Value	0
Tw	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	400
Friction Angle [deg]	31
Water Surface	Assigned per scenario
Ru Value	0
Qmc	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	200
Friction Angle [deg]	31
Water Surface	Assigned per scenario
Ru Value	0
Qgp	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	100
Friction Angle [deg]	34
Water Surface	Assigned per scenario
Ru Value	0
Qac	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	200
Friction Angle [deg]	31
Water Surface	Assigned per scenario
Ru Value	0
Qc	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	125
Cohesion [psf]	150
Friction Angle [deg]	30
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Static	Seismic	Static	Seismic	Static	Seismic	Seismic	Seismic
Cu	✗	✗	✗	✗	✓	✓	✓	✓
Tw	✓	✓	✓	✓	✓	✓	✓	✓
Qmc	✓	✓	✓	✓	✓	✓	✗	✗
Qgp	✓	✓	✗	✗	✗	✗	✗	✗
Qac	✓	✓	✓	✓	✗	✗	✗	✗
Qc	✗	✗	✗	✗	✗	✗	✓	✓

Global Minimums

A-A' - Static

Method: spencer

FS	2.413890
Center:	1089.131, 8780.128
Radius:	498.281
Left Slip Surface Endpoint:	1047.907, 8283.556
Right Slip Surface Endpoint:	1402.595, 8392.799
Resisting Moment:	4.38375e+08 lb-ft
Driving Moment:	1.81605e+08 lb-ft
Resisting Horizontal Force:	829664 lb
Driving Horizontal Force:	343704 lb
Total Slice Area:	9716.25 ft2
Surface Horizontal Width:	354.688 ft
Surface Average Height:	27.3938 ft

A-A' - Seismic

Method: spencer

FS	1.379490
Center:	592.621, 11932.210
Radius:	3778.631
Left Slip Surface Endpoint:	465.760, 8155.710
Right Slip Surface Endpoint:	2408.212, 8618.349
Resisting Moment:	5.35906e+10 lb-ft
Driving Moment:	3.88482e+10 lb-ft
Resisting Horizontal Force:	1.37261e+07 lb
Driving Horizontal Force:	9.95015e+06 lb
Total Slice Area:	184257 ft2
Surface Horizontal Width:	1942.45 ft
Surface Average Height:	94.8577 ft

B-B' - Static

Method: spencer

FS	2.216490
Center:	912.934, 8544.752
Radius:	342.387
Left Slip Surface Endpoint:	889.718, 8203.154
Right Slip Surface Endpoint:	1130.465, 8280.349
Resisting Moment:	1.23212e+08 lb-ft
Driving Moment:	5.5589e+07 lb-ft
Resisting Horizontal Force:	337661 lb
Driving Horizontal Force:	152341 lb
Total Slice Area:	4240.6 ft2
Surface Horizontal Width:	240.747 ft
Surface Average Height:	17.6144 ft

B-B' - Seismic

Method: spencer

FS	1.272220
Center:	792.373, 9199.635
Radius:	1009.522
Left Slip Surface Endpoint:	846.201, 8191.549
Right Slip Surface Endpoint:	1327.901, 8343.864
Resisting Moment:	7.8607e+08 lb-ft
Driving Moment:	6.17873e+08 lb-ft
Resisting Horizontal Force:	741790 lb
Driving Horizontal Force:	583068 lb
Total Slice Area:	10010.8 ft2
Surface Horizontal Width:	481.699 ft
Surface Average Height:	20.7823 ft

C-C' - Static

Method: spencer

FS	1.942630
Center:	1183.029, 8731.574
Radius:	290.307
Left Slip Surface Endpoint:	1191.431, 8441.389
Right Slip Surface Endpoint:	1378.902, 8517.303
Resisting Moment:	6.10194e+07 lb-ft
Driving Moment:	3.14107e+07 lb-ft
Resisting Horizontal Force:	193188 lb
Driving Horizontal Force:	99446.6 lb
Total Slice Area:	2381.5 ft2
Surface Horizontal Width:	187.471 ft
Surface Average Height:	12.7033 ft

C-C' - Seismic

Method: spencer

FS	1.195580
Center:	1013.400, 9098.121
Radius:	694.066
Left Slip Surface Endpoint:	1096.980, 8409.108
Right Slip Surface Endpoint:	1407.625, 8526.882
Resisting Moment:	2.29117e+08 lb-ft
Driving Moment:	1.91637e+08 lb-ft
Resisting Horizontal Force:	307444 lb
Driving Horizontal Force:	257152 lb
Total Slice Area:	4038.3 ft2
Surface Horizontal Width:	310.645 ft
Surface Average Height:	12.9998 ft

D-D' - Seismic

Method: spencer

FS	1.946090
Center:	1159.363, 8917.263
Radius:	617.531
Left Slip Surface Endpoint:	1154.267, 8299.757
Right Slip Surface Endpoint:	1566.800, 8453.216
Resisting Moment:	6.78776e+08 lb-ft
Driving Moment:	3.4879e+08 lb-ft
Resisting Horizontal Force:	1.01648e+06 lb
Driving Horizontal Force:	522322 lb
Total Slice Area:	12383.8 ft2
Surface Horizontal Width:	412.532 ft
Surface Average Height:	30.0189 ft

D-D' - Seismic

Method: spencer

FS	1.186350
Center:	1109.997, 9098.447
Radius:	821.656
Left Slip Surface Endpoint:	1080.471, 8277.322
Right Slip Surface Endpoint:	1642.851, 8473.000
Resisting Moment:	1.55967e+09 lb-ft
Driving Moment:	1.31468e+09 lb-ft
Resisting Horizontal Force:	1.77291e+06 lb
Driving Horizontal Force:	1.49443e+06 lb
Total Slice Area:	23675.7 ft2
Surface Horizontal Width:	562.38 ft
Surface Average Height:	42.099 ft

Global Minimum Support Data

All Open Scenarios

No Supports Present

Valid and Invalid Surfaces

A-A' - Static

Method: spencer

Number of Valid Surfaces:	11657
Number of Invalid Surfaces:	0

A-A' - Seismic

Method: spencer

Number of Valid Surfaces:	8562
Number of Invalid Surfaces:	0

B-B' - Static

Method: spencer

Number of Valid Surfaces:	12987
Number of Invalid Surfaces:	0

B-B' - Seismic

Method: spencer

Number of Valid Surfaces:	12495
Number of Invalid Surfaces:	0

C-C' - Static

Method: spencer

Number of Valid Surfaces:	13094
Number of Invalid Surfaces:	0

C-C' - Seismic

Method: spencer

Number of Valid Surfaces:	12101
Number of Invalid Surfaces:	0

D-D' - Seismic

Method: spencer

Number of Valid Surfaces:	12807
Number of Invalid Surfaces:	0

D-D' - Seismic

Method: spencer

Number of Valid Surfaces:	12229
Number of Invalid Surfaces:	0

Slice Data

A-A' - Static

Global Minimum Query (spencer) - Safety Factor: 2.41389

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	6.43057	425.712	-4.37478	Qac	200	31	110.078	265.715	109.368	0	109.368	100.947	100.947
2	6.43057	2357.88	-3.63352	Qac	200	31	193.368	466.769	443.977	0	443.977	431.698	431.698
3	6.43057	4780.71	-2.89286	Qac	200	31	296.482	715.674	858.226	0	858.226	843.244	843.244
4	7.21417	8343.34	-2.10762	Tw	400	31	498.188	1202.57	1335.7	0	1335.7	1317.37	1317.37
5	7.21417	11612.4	-1.2777	Tw	400	31	618.015	1491.82	1817.08	0	1817.08	1803.3	1803.3
6	7.21417	14736.6	-0.448038	Tw	400	31	730.39	1763.08	2268.53	0	2268.53	2262.82	2262.82
7	7.21417	17195.6	0.381527	Tw	400	31	816.197	1970.21	2613.27	0	2613.27	2618.71	2618.71
8	7.21417	18788.9	1.21117	Tw	400	31	868.735	2097.03	2824.34	0	2824.34	2842.7	2842.7
9	7.21417	20280.1	2.04107	Tw	400	31	916.657	2212.71	3016.87	0	3016.87	3049.53	3049.53
10	7.21417	21673	2.8714	Tw	400	31	960.226	2317.88	3191.88	0	3191.88	3240.04	3240.04
11	7.21417	22967.7	3.70233	Tw	400	31	999.528	2412.75	3349.78	0	3349.78	3414.45	3414.45
12	7.21417	24163.7	4.53404	Tw	400	31	1034.66	2497.55	3490.91	0	3490.91	3572.96	3572.96
13	7.21417	25260.9	5.36671	Tw	400	31	1065.69	2572.47	3615.59	0	3615.59	3715.7	3715.7
14	7.21417	26276.2	6.20052	Tw	400	31	1093.33	2639.17	3726.61	0	3726.61	3845.39	3845.39
15	7.21417	27610.8	7.03565	Tw	400	31	1131.56	2731.45	3880.19	0	3880.19	4019.84	4019.84
16	7.21417	29023.3	7.87229	Tw	400	31	1171.81	2828.61	4041.89	0	4041.89	4203.91	4203.91
17	7.21417	30335.1	8.71062	Tw	400	31	1207.91	2915.76	4186.93	0	4186.93	4372	4372
18	7.21417	31545.4	9.55083	Tw	400	31	1239.93	2993.06	4315.57	0	4315.57	4524.2	4524.2
19	7.21417	32653.6	10.3931	Tw	400	31	1267.94	3060.66	4428.07	0	4428.07	4660.62	4660.62
20	7.21417	33658.8	11.2377	Tw	400	31	1291.98	3118.69	4524.65	0	4524.65	4781.36	4781.36
21	7.21417	34560.2	12.0847	Tw	400	31	1312.11	3167.29	4605.55	0	4605.55	4886.47	4886.47
22	7.21417	35356.8	12.9345	Tw	400	31	1328.39	3206.59	4670.94	0	4670.94	4976.02	4976.02
23	7.21417	36047.6	13.7871	Tw	400	31	1340.86	3236.68	4721.03	0	4721.03	5050.05	5050.05
24	7.21417	36631.4	14.6429	Tw	400	31	1349.56	3257.69	4756	0	4756	5108.61	5108.61
25	7.21417	37107	15.502	Tw	400	31	1354.54	3269.71	4776	0	4776	5151.69	5151.69
26	7.21417	37473.2	16.3647	Tw	400	31	1355.83	3272.83	4781.19	0	4781.19	5179.33	5179.33
27	7.21417	37728.2	17.2313	Tw	400	31	1353.47	3267.12	4771.68	0	4771.68	5191.46	5191.46
28	7.21417	37710.9	18.1019	Tw	400	31	1342.49	3240.62	4727.58	0	4727.58	5166.42	5166.42
29	7.21417	37442.4	18.9769	Tw	400	31	1323.76	3195.41	4652.34	0	4652.34	5107.55	5107.55
30	7.21417	37058.1	19.8565	Tw	400	31	1301.63	3141.98	4563.42	0	4563.42	5033.48	5033.48
31	7.21417	36556.1	20.741	Tw	400	31	1276.11	3080.38	4460.91	0	4460.91	4944.16	4944.16
32	7.21417	35934.2	21.6307	Tw	400	31	1247.23	3010.68	4344.9	0	4344.9	4839.49	4839.49
33	7.21417	35190.4	22.5259	Tw	400	31	1215.02	2932.92	4215.48	0	4215.48	4719.4	4719.4
34	7.21417	34322.2	23.427	Tw	400	31	1179.48	2847.14	4072.72	0	4072.72	4583.79	4583.79
35	7.21417	33521.3	24.3343	Tw	400	31	1146.35	2767.17	3939.63	0	3939.63	4458.05	4458.05
36	7.21417	32910.7	25.248	Tw	400	31	1119.16	2701.54	3830.4	0	3830.4	4358.19	4358.19
37	7.21417	32172.4	26.1688	Tw	400	31	1088.57	2627.68	3707.49	0	3707.49	4242.39	4242.39
38	7.21417	31298.5	27.0968	Tw	400	31	1054.43	2545.29	3570.36	0	3570.36	4109.86	4109.86
39	7.21417	30285.7	28.0326	Tw	400	31	1016.77	2454.38	3419.06	0	3419.06	3960.43	3960.43
40	7.21417	29130.5	28.9767	Tw	400	31	975.587	2354.96	3253.6	0	3253.6	3793.86	3793.86
41	7.21417	27828.9	29.9294	Tw	400	31	930.887	2247.06	3074.03	0	3074.03	3609.95	3609.95
42	7.21417	26376.7	30.8913	Tw	400	31	882.671	2130.67	2880.31	0	2880.31	3408.4	3408.4
43	7.21417	24658.1	31.863	Tw	400	31	827.896	1998.45	2660.27	0	2660.27	3174.85	3174.85
44	7.21417	21823	32.8451	Tw	400	31	743.828	1795.52	2322.52	0	2322.52	2802.72	2802.72
45	7.21417	18602.8	33.8381	Tw	400	31	650.958	1571.34	1949.43	0	1949.43	2385.84	2385.84
46	7.21417	15218.6	34.8429	Tw	400	31	555.478	1340.86	1565.85	0	1565.85	1952.54	1952.54
47	7.21417	11709.6	35.86	Tw	400	31	458.584	1106.97	1176.6	0	1176.6	1508.07	1508.07
48	5.99085	6997.92	36.802	Qgp	100	34	279.934	675.729	853.552	0	853.552	1062.98	1062.98
49	5.99085	4323.54	37.6673	Qgp	100	34	185.629	448.088	516.062	0	516.062	659.363	659.363
50	5.99085	1459.63	38.5428	Qgp	100	34	92.928	224.318	184.309	0	184.309	258.341	258.341

A-A' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.37949

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	41.5732	23329.2	-1.60865	Qac	200	31	456.207	629.333	714.529	0	714.529	701.718	701.718
2	38.7934	71799.7	-0.999178	Tw	400	31	1262.02	1740.94	2231.71	0	2231.71	2209.7	2209.7
3	38.7934	114379	-0.410894	Tw	400	31	1784.22	2461.32	3430.62	0	3430.62	3417.82	3417.82
4	38.7934	158154	0.177347	Tw	400	31	2310.76	3187.67	4639.45	0	4639.45	4646.6	4646.6
5	38.7934	194747	0.765606	Tw	400	31	2738.56	3777.81	5621.63	0	5621.63	5658.23	5658.23
6	38.7934	226716	1.35395	Tw	400	31	3101.63	4278.67	6455.19	0	6455.19	6528.5	6528.5
7	38.7934	250497	1.94243	Tw	400	31	3358.93	4633.61	7045.9	0	7045.9	7159.82	7159.82
8	38.7934	295398	2.53112	Tw	400	31	3862.94	5328.89	8203.04	0	8203.04	8373.8	8373.8
9	38.7934	347101	3.12007	Tw	400	31	4437.42	6121.37	9521.96	0	9521.96	9763.84	9763.84
10	38.7934	393683	3.70936	Tw	400	31	4940.84	6815.84	10677.7	0	10677.7	10998.1	10998.1
11	38.7934	434209	4.29904	Tw	400	31	5364.35	7400.07	11650.1	0	11650.1	12053.3	12053.3
12	38.7934	474190	4.88917	Tw	400	31	5773.39	7964.33	12589.1	0	12589.1	13083	13083
13	38.7934	506391	5.47983	Tw	400	31	6086.09	8395.7	13307.1	0	13307.1	13890.9	13890.9
14	38.7934	525341	6.07107	Tw	400	31	6243.51	8612.86	13668.5	0	13668.5	14332.6	14332.6
15	38.7934	524648	6.66296	Tw	400	31	6178.69	8523.44	13519.7	0	13519.7	14241.4	14241.4
16	38.7934	539185	7.25557	Tw	400	31	6283.05	8667.4	13759.3	0	13759.3	14559.2	14559.2
17	38.7934	581009	7.84895	Tw	400	31	6683.85	9220.31	14679.5	0	14679.5	15600.8	15600.8
18	38.7934	604531	8.44319	Tw	400	31	6878.48	9488.79	15126.3	0	15126.3	16147.3	16147.3
19	38.7934	639227	9.03834	Tw	400	31	7189.22	9917.46	15839.7	0	15839.7	16983.3	16983.3
20	38.7934	673451	9.63448	Tw	400	31	7488.88	10330.8	16527.7	0	16527.7	17799	17799
21	38.7934	700427	10.2317	Tw	400	31	7706.18	10630.6	17026.6	0	17026.6	18417.6	18417.6
22	38.7934	726449	10.83	Tw	400	31	7909.15	10910.6	17492.5	0	17492.5	19005.5	19005.5
23	38.7934	759642	11.4295	Tw	400	31	8182.15	11287.2	18119.4	0	18119.4	19773.6	19773.6
24	38.7934	766451	12.0303	Tw	400	31	8178.96	11282.8	18112.1	0	18112.1	19855.1	19855.1
25	38.7934	754058	12.6324	Tw	400	31	7980.05	11008.4	17655.3	0	17655.3	19443.8	19443.8
26	38.7934	739490	13.236	Tw	400	31	7762.22	10707.9	17155.2	0	17155.2	18981	18981
27	38.7934	725989	13.841	Tw	400	31	7558.45	10426.8	16687.4	0	16687.4	18549.6	18549.6
28	38.7934	710938	14.4477	Tw	400	31	7342.41	10128.8	16191.4	0	16191.4	18083.1	18083.1
29	38.7934	696334	15.056	Tw	400	31	7134.09	9841.41	15713.2	0	15713.2	17632.2	17632.2
30	38.7934	683651	15.666	Tw	400	31	6947.63	9584.18	15285.1	0	15285.1	17233.5	17233.5
31	38.7934	672886	16.2779	Tw	400	31	6782.41	9356.27	14905.7	0	14905.7	16886.2	16886.2
32	38.7934	659089	16.8916	Tw	400	31	6590.66	9091.75	14465.5	0	14465.5	16466.8	16466.8
33	38.7934	641874	17.5074	Tw	400	31	6369.46	8786.6	13957.6	0	13957.6	15966.8	15966.8
34	38.7934	625779	18.1253	Tw	400	31	6162.16	8500.64	13481.7	0	13481.7	15498.8	15498.8
35	38.7934	611783	18.7453	Tw	400	31	5977.5	8245.9	13057.8	0	13057.8	15086.3	15086.3
36	38.7934	598282	19.3677	Tw	400	31	5800.15	8001.25	12650.6	0	12650.6	14689.5	14689.5
37	38.7934	579755	19.9924	Tw	400	31	5579.61	7697.01	12144.3	0	12144.3	14174.2	14174.2
38	38.7934	560553	20.6197	Tw	400	31	5356.38	7389.07	11631.8	0	11631.8	13647.2	13647.2
39	38.7934	541881	21.2495	Tw	400	31	5141.38	7092.48	11138.1	0	11138.1	13137.5	13137.5
40	38.7934	520189	21.882	Tw	400	31	4902.95	6763.57	10590.7	0	10590.7	12559.9	12559.9
41	38.7934	498379	22.5173	Tw	400	31	4667.28	6438.47	10049.7	0	10049.7	11984.6	11984.6
42	38.7934	475375	23.1556	Tw	400	31	4425	6104.25	9493.47	0	9493.47	11386	11386
43	38.7934	444254	23.7969	Tw	400	31	4116.66	5678.89	8785.56	0	8785.56	10601	10601
44	38.7934	404258	24.4415	Tw	400	31	3737.69	5156.11	7915.51	0	7915.51	9614.27	9614.27
45	38.7934	358072	25.0893	Tw	400	31	3312.94	4570.17	6940.33	0	6940.33	8491.47	8491.47
46	38.7934	302130	25.7406	Tw	400	31	2813.94	3881.8	5794.69	0	5794.69	7151.4	7151.4
47	38.7934	240595	26.3954	Tw	400	31	2277.55	3141.86	4563.22	0	4563.22	5693.58	5693.58
48	38.7934	164704	27.054	Tw	400	31	1633	2252.71	3083.41	0	3083.41	3917.41	3917.41
49	38.7934	104093	27.7165	Tw	400	31	1124.99	1551.91	1917.1	0	1917.1	2508.15	2508.15
50	38.7934	37306.3	28.3831	Tw	400	31	561.436	774.496	623.266	0	623.266	926.619	926.619

B-B' - Static

Global Minimum Query (spencer) - Safety Factor: 2.21649

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.81493	474.622	-3.4844	Qmc	200	31	130.738	289.778	149.416	0	149.416	141.456	141.456
2	4.81493	1403.4	-2.67746	Qmc	200	31	188.756	418.376	363.438	0	363.438	354.61	354.61
3	4.81493	2291.28	-1.87106	Qmc	200	31	243.167	538.977	564.153	0	564.153	556.21	556.21
4	4.81493	3138.34	-1.06503	Qmc	200	31	294.071	651.805	751.93	0	751.93	746.463	746.463
5	4.81493	3944.63	-0.259204	Qmc	200	31	341.563	757.07	927.121	0	927.121	925.576	925.576
6	4.81493	4710.15	0.546567	Qmc	200	31	385.73	854.967	1090.05	0	1090.05	1093.73	1093.73
7	4.81493	5469.39	1.35245	Qmc	200	31	428.745	950.309	1248.72	0	1248.72	1258.85	1258.85
8	4.81493	6359.37	2.15859	Qmc	200	31	478.854	1061.38	1433.57	0	1433.57	1451.62	1451.62
9	4.81493	7231.91	2.96517	Qmc	200	31	527.056	1168.21	1611.38	0	1611.38	1638.68	1638.68
10	4.81493	8063.52	3.77233	Qmc	200	31	572.008	1267.85	1777.2	0	1777.2	1814.92	1814.92
11	4.81493	8854.1	4.58025	Qmc	200	31	613.781	1360.44	1931.3	0	1931.3	1980.47	1980.47
12	4.81493	9603.54	5.38908	Qmc	200	31	652.441	1446.13	2073.92	0	2073.92	2135.46	2135.46
13	4.81493	10311.7	6.19898	Qmc	200	31	688.056	1525.07	2205.27	0	2205.27	2280.01	2280.01
14	4.81493	10978.3	7.01014	Qmc	200	31	720.675	1597.37	2325.61	0	2325.61	2414.23	2414.23
15	4.81493	11603.3	7.8227	Qmc	200	31	750.362	1663.17	2435.12	0	2435.12	2538.21	2538.21
16	4.81493	12186.3	8.63686	Qmc	200	31	777.161	1722.57	2533.98	0	2533.98	2652.03	2652.03
17	4.81493	12727.2	9.45277	Qmc	200	31	801.132	1775.7	2622.4	0	2622.4	2755.79	2755.79
18	4.81493	13225.6	10.2706	Qmc	200	31	822.314	1822.65	2700.55	0	2700.55	2849.55	2849.55
19	4.81493	13681.2	11.0906	Qmc	200	31	840.748	1863.51	2768.55	0	2768.55	2933.36	2933.36
20	4.81493	14093.7	11.9129	Qmc	200	31	856.485	1898.39	2826.59	0	2826.59	3007.28	3007.28
21	4.81493	14462.7	12.7377	Qmc	200	31	869.555	1927.36	2874.82	0	2874.82	3071.38	3071.38
22	4.81493	14787.7	13.5651	Qmc	200	31	879.999	1950.51	2913.32	0	2913.32	3125.65	3125.65
23	4.81493	15068.4	14.3955	Qmc	200	31	887.845	1967.9	2942.28	0	2942.28	3170.17	3170.17
24	4.81493	15304.2	15.229	Qmc	200	31	893.133	1979.62	2961.78	0	2961.78	3204.93	3204.93
25	4.81493	15494.7	16.0658	Qmc	200	31	895.889	1985.73	2971.96	0	2971.96	3229.97	3229.97
26	4.81493	15639.2	16.9061	Qmc	200	31	896.142	1986.29	2972.88	0	2972.88	3245.26	3245.26
27	4.81493	15737.2	17.7502	Qmc	200	31	893.918	1981.36	2964.67	0	2964.67	3250.82	3250.82
28	4.81493	15787.6	18.5983	Qmc	200	31	889.217	1970.94	2947.35	0	2947.35	3246.57	3246.57
29	4.81493	15789.9	19.4506	Qmc	200	31	882.079	1955.12	2921.01	0	2921.01	3232.51	3232.51
30	4.81493	15743.6	20.3074	Qmc	200	31	872.533	1933.96	2885.79	0	2885.79	3208.68	3208.68
31	4.81493	15647.9	21.169	Qmc	200	31	860.595	1907.5	2841.77	0	2841.77	3175.04	3175.04
32	4.81493	15501.9	22.0357	Qmc	200	31	846.289	1875.79	2788.99	0	2788.99	3131.53	3131.53
33	4.81493	15304.8	22.9077	Qmc	200	31	829.627	1838.86	2727.53	0	2727.53	3078.11	3078.11
34	4.81493	15055.5	23.7853	Qmc	200	31	810.624	1796.74	2657.43	0	2657.43	3014.71	3014.71
35	4.81493	14752.9	24.6689	Qmc	200	31	789.297	1749.47	2578.75	0	2578.75	2941.27	2941.27
36	4.81493	14396.1	25.5588	Qmc	200	31	765.657	1697.07	2491.54	0	2491.54	2857.71	2857.71
37	4.81493	13983.8	26.4554	Qmc	200	31	739.715	1639.57	2395.84	0	2395.84	2763.93	2763.93
38	4.81493	13514.6	27.359	Qmc	200	31	711.481	1576.99	2291.68	0	2291.68	2659.84	2659.84
39	4.81493	12987.2	28.2701	Qmc	200	31	680.964	1509.35	2179.12	0	2179.12	2545.33	2545.33
40	4.81493	12400.2	29.189	Qmc	200	31	648.169	1436.66	2058.15	0	2058.15	2420.24	2420.24
41	4.81493	11751.9	30.1162	Qmc	200	31	613.114	1358.96	1928.83	0	1928.83	2284.47	2284.47
42	4.81493	11032.5	31.0522	Qmc	200	31	575.428	1275.43	1789.82	0	1789.82	2136.29	2136.29
43	4.81493	10239	31.9975	Qmc	200	31	535.092	1186.03	1641.02	0	1641.02	1975.35	1975.35
44	4.81493	9378.58	32.9527	Qmc	200	31	492.517	1091.66	1483.97	0	1483.97	1803.23	1803.23
45	4.81493	8449.19	33.9183	Qmc	200	31	447.71	992.344	1318.68	0	1318.68	1619.74	1619.74
46	4.81493	7438.63	34.895	Qmc	200	31	400.256	887.163	1143.63	0	1143.63	1422.8	1422.8
47	4.81493	6039.31	35.8834	Qmc	200	31	337.304	747.63	911.41	0	911.41	1155.43	1155.43
48	4.81493	4412.34	36.8844	Qmc	200	31	266.143	589.903	648.908	0	648.908	848.62	848.62
49	4.81493	2705.68	37.8986	Qmc	200	31	193.227	428.286	379.931	0	379.931	530.347	530.347
50	4.81493	916.015	38.927	Qmc	200	31	121.806	269.981	116.469	0	116.469	214.848	214.848

B-B' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.27222

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	9.63399	1209.34	3.33035	Qmc	200	31	250.035	318.099	196.551	0	196.551	211.1	211.1
2	9.63399	3572.34	3.87822	Qmc	200	31	370.584	471.465	451.794	0	451.794	476.917	476.917
3	9.63399	5823.85	4.42645	Qmc	200	31	483.129	614.646	690.087	0	690.087	727.486	727.486
4	9.63399	7963.64	4.97509	Qmc	200	31	587.868	747.898	911.856	0	911.856	963.03	963.03
5	9.63399	9991.45	5.52418	Qmc	200	31	684.997	871.467	1117.51	0	1117.51	1183.76	1183.76
6	9.63399	11907	6.07378	Qmc	200	31	774.699	985.588	1307.44	0	1307.44	1389.88	1389.88
7	9.63399	13709.9	6.62394	Qmc	200	31	857.154	1090.49	1482.02	0	1482.02	1581.56	1581.56
8	9.63399	15430.5	7.17472	Qmc	200	31	934.03	1188.29	1644.8	0	1644.8	1762.37	1762.37
9	9.63399	17673.1	7.72617	Qmc	200	31	1034.73	1316.41	1858.02	0	1858.02	1998.4	1998.4
10	9.63399	20054.3	8.27833	Qmc	200	31	1140.2	1450.58	2081.33	0	2081.33	2247.22	2247.22
11	9.63399	22321.3	8.83127	Qmc	200	31	1238.26	1575.34	2288.95	0	2288.95	2481.34	2481.34
12	9.63399	24473.5	9.38504	Qmc	200	31	1329.07	1690.87	2481.23	0	2481.23	2700.9	2700.9
13	9.63399	26510.4	9.9397	Qmc	200	31	1412.79	1797.38	2658.48	0	2658.48	2906.06	2906.06
14	9.63399	28431.5	10.4953	Qmc	200	31	1489.56	1895.05	2821.04	0	2821.04	3096.99	3096.99
15	9.63399	30236.1	11.0519	Qmc	200	31	1559.53	1984.07	2969.19	0	2969.19	3273.8	3273.8
16	9.63399	31923.6	11.6096	Qmc	200	31	1622.84	2064.61	3103.23	0	3103.23	3436.63	3436.63
17	9.63399	33493.2	12.1683	Qmc	200	31	1679.62	2136.84	3223.44	0	3223.44	3585.61	3585.61
18	9.63399	34944.3	12.7283	Qmc	200	31	1729.98	2200.91	3330.08	0	3330.08	3720.84	3720.84
19	9.63399	36274.8	13.2895	Qmc	200	31	1773.99	2256.91	3423.28	0	3423.28	3842.29	3842.29
20	9.63399	37484.1	13.852	Qmc	200	31	1811.81	2305.02	3503.34	0	3503.34	3950.11	3950.11
21	9.63399	38572.5	14.4158	Qmc	200	31	1843.56	2345.42	3570.58	0	3570.58	4044.47	4044.47
22	9.63399	39539	14.9811	Qmc	200	31	1869.39	2378.27	3625.25	0	3625.25	4125.49	4125.49
23	9.63399	40382.7	15.5479	Qmc	200	31	1889.37	2403.69	3667.56	0	3667.56	4193.23	4193.23
24	9.63399	41102.6	16.1163	Qmc	200	31	1903.62	2421.82	3697.73	0	3697.73	4247.77	4247.77
25	9.63399	41697.5	16.6862	Qmc	200	31	1912.23	2432.78	3715.97	0	3715.97	4289.17	4289.17
26	9.63399	42133.4	17.2579	Qmc	200	31	1913.94	2434.95	3719.57	0	3719.57	4314.16	4314.16
27	9.63399	42405.7	17.8314	Qmc	200	31	1908.71	2428.3	3708.51	0	3708.51	4322.49	4322.49
28	9.63399	42213.2	18.4067	Qmc	200	31	1884.45	2397.44	3657.16	0	3657.16	4284.28	4284.28
29	9.63399	40479.8	18.984	Qmc	200	31	1798.17	2287.67	3474.47	0	3474.47	4093.06	4093.06
30	9.63399	38458.9	19.5632	Qmc	200	31	1701.74	2164.99	3270.3	0	3270.3	3875.03	3875.03
31	9.63399	36406.9	20.1446	Qmc	200	31	1605.64	2042.73	3066.82	0	3066.82	3655.82	3655.82
32	9.63399	34879.8	20.7281	Qmc	200	31	1531.76	1948.74	2910.39	0	2910.39	3490.05	3490.05
33	9.63399	33336.1	21.3139	Qmc	200	31	1458.4	1855.41	2755.06	0	2755.06	3324.07	3324.07
34	9.63399	31778.3	21.902	Qmc	200	31	1385.67	1762.88	2601.07	0	2601.07	3158.16	3158.16
35	9.63399	30650.1	22.4926	Qmc	200	31	1330.56	1692.76	2484.36	0	2484.36	3035.29	3035.29
36	9.63399	29452.6	23.0856	Qmc	200	31	1273.66	1620.38	2363.9	0	2363.9	2906.79	2906.79
37	9.63399	28112.9	23.6814	Qmc	200	31	1212.31	1542.33	2234	0	2234	2765.7	2765.7
38	9.63399	26629	24.2798	Qmc	200	31	1146.57	1458.69	2094.81	0	2094.81	2612.02	2612.02
39	9.63399	24998.9	24.8811	Qmc	200	31	1076.5	1369.55	1946.45	0	1946.45	2445.72	2445.72
40	9.63399	23220.6	25.4853	Qmc	200	31	1002.17	1274.98	1789.07	0	1789.07	2266.77	2266.77
41	9.63399	21495	26.0926	Qmc	200	31	931.002	1184.44	1638.39	0	1638.39	2094.33	2094.33
42	9.63399	20083.1	26.703	Qmc	200	31	872.289	1109.74	1514.07	0	1514.07	1952.84	1952.84
43	9.63399	18534.2	27.3168	Qmc	200	31	809.69	1030.1	1381.52	0	1381.52	1799.73	1799.73
44	9.63399	16827.5	27.9339	Qmc	200	31	742.601	944.752	1239.48	0	1239.48	1633.23	1633.23
45	9.63399	14960.1	28.5546	Qmc	200	31	671.081	853.763	1088.04	0	1088.04	1453.24	1453.24
46	9.63399	12929.4	29.179	Qmc	200	31	595.187	757.209	927.351	0	927.351	1259.7	1259.7
47	9.63399	10730.3	29.8072	Qmc	200	31	514.909	655.077	757.376	0	757.376	1052.35	1052.35
48	9.63399	8236.74	30.4394	Qmc	200	31	426.141	542.145	569.425	0	569.425	819.834	819.834
49	9.63399	5496.06	31.0757	Qmc	200	31	330.76	420.799	367.471	0	367.471	566.806	566.806
50	9.63399	2182.38	31.7163	Qmc	200	31	214.944	273.456	122.251	0	122.251	255.088	255.088

C-C' - Static

Global Minimum Query (spencer) - Safety Factor: 1.94263

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.69701	270.863	2.02338	Qmc	200	31	139.435	270.871	117.949	0	117.949	122.875	122.875
2	3.69701	860.407	2.75369	Qmc	200	31	192.333	373.631	288.97	0	288.97	298.22	298.22
3	3.69701	1441.97	3.48444	Qmc	200	31	243.529	473.087	454.493	0	454.493	469.322	469.322
4	3.69701	2001.66	4.21577	Qmc	200	31	291.823	566.904	610.629	0	610.629	632.14	632.14
5	3.69701	2539.4	4.94778	Qmc	200	31	337.282	655.215	757.607	0	757.607	786.806	786.806
6	3.69701	3055.15	5.6806	Qmc	200	31	379.974	738.148	895.628	0	895.628	933.424	933.424
7	3.69701	3548.8	6.41436	Qmc	200	31	419.956	815.82	1024.9	0	1024.9	1072.11	1072.11
8	3.69701	4020.29	7.14917	Qmc	200	31	457.29	888.346	1145.6	0	1145.6	1202.96	1202.96
9	3.69701	4469.5	7.88517	Qmc	200	31	492.03	955.833	1257.92	0	1257.92	1326.06	1326.06
10	3.69701	4896.32	8.62248	Qmc	200	31	524.228	1018.38	1362.02	0	1362.02	1441.51	1441.51
11	3.69701	5300.63	9.36123	Qmc	200	31	553.935	1076.09	1458.06	0	1458.06	1549.38	1549.38
12	3.69701	5682.28	10.1016	Qmc	200	31	581.197	1129.05	1546.2	0	1546.2	1649.74	1649.74
13	3.69701	6041.13	10.8436	Qmc	200	31	606.059	1177.35	1626.58	0	1626.58	1742.67	1742.67
14	3.69701	6377.01	11.5875	Qmc	200	31	628.565	1221.07	1699.35	0	1699.35	1828.23	1828.23
15	3.69701	6689.75	12.3333	Qmc	200	31	648.755	1260.29	1764.62	0	1764.62	1906.46	1906.46
16	3.69701	6979.14	13.0813	Qmc	200	31	666.663	1295.08	1822.53	0	1822.53	1977.43	1977.43
17	3.69701	7244.99	13.8316	Qmc	200	31	682.333	1325.52	1873.18	0	1873.18	2041.18	2041.18
18	3.69701	7487.07	14.5843	Qmc	200	31	695.794	1351.67	1916.71	0	1916.71	2097.75	2097.75
19	3.69701	7705.15	15.3396	Qmc	200	31	707.083	1373.6	1953.2	0	1953.2	2147.17	2147.17
20	3.69701	7898.96	16.0976	Qmc	200	31	716.23	1391.37	1982.77	0	1982.77	2189.47	2189.47
21	3.69701	8068.23	16.8585	Qmc	200	31	723.262	1405.03	2005.51	0	2005.51	2224.68	2224.68
22	3.69701	8212.69	17.6225	Qmc	200	31	728.209	1414.64	2021.5	0	2021.5	2252.82	2252.82
23	3.69701	8332	18.3898	Qmc	200	31	731.097	1420.25	2030.84	0	2030.84	2273.9	2273.9
24	3.69701	8425.85	19.1605	Qmc	200	31	731.956	1421.92	2033.61	0	2033.61	2287.94	2287.94
25	3.69701	8500.54	19.9348	Qmc	200	31	731.292	1420.63	2031.47	0	2031.47	2296.7	2296.7
26	3.69701	8579.31	20.7129	Qmc	200	31	730.849	1419.77	2030.05	0	2030.05	2306.4	2306.4
27	3.69701	8635.19	21.4951	Qmc	200	31	728.667	1415.53	2022.97	0	2022.97	2309.93	2309.93
28	3.69701	8664.05	22.2814	Qmc	200	31	724.477	1407.39	2009.44	0	2009.44	2306.29	2306.29
29	3.69701	8665.45	23.0722	Qmc	200	31	718.31	1395.41	1989.5	0	1989.5	2295.47	2295.47
30	5.07579	11845.3	24.0172	Qmc	200	31	708.22	1375.81	1956.89	0	1956.89	2272.46	2272.46
31	3.75909	8698.85	24.9747	Qmc	200	31	695.748	1351.58	1916.55	0	1916.55	2240.61	2240.61
32	3.75909	8600.15	25.796	Qmc	200	31	682.781	1326.39	1874.63	0	1874.63	2204.64	2204.64
33	3.75909	8470.11	26.6229	Qmc	200	31	667.847	1297.38	1826.34	0	1826.34	2161.11	2161.11
34	3.75909	8308.04	27.4559	Qmc	200	31	650.947	1264.55	1771.72	0	1771.72	2109.94	2109.94
35	3.75909	8113.23	28.2953	Qmc	200	31	632.107	1227.95	1710.8	0	1710.8	2051.09	2051.09
36	3.75909	7884.91	29.1413	Qmc	200	31	611.337	1187.6	1643.64	0	1643.64	1984.49	1984.49
37	3.75909	7622.25	29.9943	Qmc	200	31	588.644	1143.52	1570.28	0	1570.28	1910.05	1910.05
38	3.75909	7324.37	30.8547	Qmc	200	31	564.043	1095.73	1490.74	0	1490.74	1827.71	1827.71
39	3.75909	6990.33	31.723	Qmc	200	31	537.542	1044.24	1405.06	0	1405.06	1737.35	1737.35
40	3.75909	6619.11	32.5994	Qmc	200	31	509.151	989.092	1313.27	0	1313.27	1638.88	1638.88
41	3.75909	6209.62	33.4845	Qmc	200	31	478.879	930.285	1215.4	0	1215.4	1532.18	1532.18
42	3.75909	5760.69	34.3787	Qmc	200	31	446.735	867.841	1111.47	0	1111.47	1417.12	1417.12
43	3.75909	5271.05	35.2826	Qmc	200	31	412.726	801.773	1001.52	0	1001.52	1293.56	1293.56
44	3.75909	4739.35	36.1967	Qmc	200	31	376.858	732.095	885.555	0	885.555	1161.34	1161.34
45	3.75909	4164.11	37.1216	Qmc	200	31	339.139	658.822	763.608	0	763.608	1020.3	1020.3
46	3.75909	3543.72	38.058	Qmc	200	31	299.575	581.964	635.696	0	635.696	870.239	870.239
47	3.75909	2876.45	39.0065	Qmc	200	31	258.174	501.536	501.84	0	501.84	710.954	710.954
48	3.75909	2160.4	39.9679	Qmc	200	31	214.94	417.549	362.063	0	362.063	542.214	542.214
49	3.75909	1393.51	40.943	Qmc	200	31	169.881	330.015	216.381	0	216.381	363.759	363.759
50	3.75909	498.796	41.9328	Qmc	200	31	121.719	236.454	60.6698	0	60.6698	170.007	170.007

C-C' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.19558

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	6.21063	521.112	7.15981	Qmc	200	31	239.921	286.845	144.535	0	144.535	174.673	174.673
2	6.21063	1540.57	7.69186	Qmc	200	31	321.227	384.052	306.313	0	306.313	349.698	349.698
3	6.21063	2515.05	8.20953	Qmc	200	31	397.405	475.13	457.893	0	457.893	515.228	515.228
4	6.21063	3445.04	8.72788	Qmc	200	31	468.586	560.232	599.526	0	599.526	671.463	671.463
5	6.21063	4330.34	9.24696	Qmc	200	31	534.882	639.494	731.441	0	731.441	818.523	818.523
6	6.21063	5170.77	9.7668	Qmc	200	31	596.403	713.048	853.857	0	853.857	956.517	956.517
7	6.21063	5966.12	10.2875	Qmc	200	31	653.257	781.021	966.98	0	966.98	1085.55	1085.55
8	6.21063	6716.18	10.809	Qmc	200	31	705.543	843.533	1071.02	0	1071.02	1205.72	1205.72
9	6.21063	7420.71	11.3314	Qmc	200	31	753.36	900.702	1166.16	0	1166.16	1317.13	1317.13
10	6.21063	8079.47	11.8548	Qmc	200	31	796.802	952.641	1252.6	0	1252.6	1419.86	1419.86
11	6.21063	8692.2	12.3791	Qmc	200	31	835.962	999.46	1330.53	0	1330.53	1514	1514
12	6.21063	9258.63	12.9046	Qmc	200	31	870.928	1041.26	1400.1	0	1400.1	1599.64	1599.64
13	6.21063	9778.47	13.4311	Qmc	200	31	901.783	1078.15	1461.49	0	1461.49	1676.85	1676.85
14	6.21063	10251.4	13.9588	Qmc	200	31	928.61	1110.23	1514.87	0	1514.87	1745.69	1745.69
15	6.21063	10677.2	14.4878	Qmc	200	31	951.489	1137.58	1560.39	0	1560.39	1806.25	1806.25
16	6.21063	11082.8	15.0179	Qmc	200	31	972.454	1162.65	1602.11	0	1602.11	1863.01	1863.01
17	6.21063	11632.3	15.5494	Qmc	200	31	1003.13	1199.33	1663.16	0	1663.16	1942.29	1942.29
18	6.21063	12170.5	16.0823	Qmc	200	31	1032.39	1234.3	1721.37	0	1721.37	2019	2019
19	6.21063	12660	16.6166	Qmc	200	31	1057.65	1264.51	1771.64	0	1771.64	2087.27	2087.27
20	6.21063	13100.5	17.1524	Qmc	200	31	1079.01	1290.04	1814.14	0	1814.14	2147.17	2147.17
21	6.21063	13491.5	17.6898	Qmc	200	31	1096.52	1310.98	1848.99	0	1848.99	2198.71	2198.71
22	6.21063	13832.6	18.2287	Qmc	200	31	1110.26	1327.41	1876.33	0	1876.33	2241.98	2241.98
23	6.21063	14123.4	18.7694	Qmc	200	31	1120.29	1339.4	1896.29	0	1896.29	2277	2277
24	6.21063	14363.3	19.3117	Qmc	200	31	1126.67	1347.03	1908.99	0	1908.99	2303.8	2303.8
25	6.21063	14551.9	19.8559	Qmc	200	31	1129.48	1350.38	1914.54	0	1914.54	2322.43	2322.43
26	6.21063	14688.6	20.402	Qmc	200	31	1128.74	1349.5	1913.09	0	1913.09	2332.91	2332.91
27	6.21063	14773	20.95	Qmc	200	31	1124.54	1344.48	1904.74	0	1904.74	2335.28	2335.28
28	6.21063	14804.3	21.5	Qmc	200	31	1116.92	1335.37	1889.57	0	1889.57	2329.54	2329.54
29	6.21063	14782.1	22.0521	Qmc	200	31	1105.95	1322.25	1867.73	0	1867.73	2315.74	2315.74
30	6.21063	14709.4	22.6064	Qmc	200	31	1091.89	1305.44	1839.77	0	1839.77	2294.42	2294.42
31	6.21063	14660.6	23.1629	Qmc	200	31	1079.48	1290.6	1815.06	0	1815.06	2276.89	2276.89
32	6.21063	14588.6	23.7217	Qmc	200	31	1065.73	1274.17	1787.72	0	1787.72	2256.02	2256.02
33	6.21063	14460.2	24.2829	Qmc	200	31	1048.7	1253.8	1753.83	0	1753.83	2226.95	2226.95
34	6.21063	14274.9	24.8467	Qmc	200	31	1028.42	1229.56	1713.48	0	1713.48	2189.69	2189.69
35	6.21063	14031.9	25.413	Qmc	200	31	1004.95	1201.5	1666.78	0	1666.78	2144.24	2144.24
36	6.21063	13730.3	25.9819	Qmc	200	31	978.331	1169.67	1613.8	0	1613.8	2090.58	2090.58
37	6.37197	13711	26.5611	Qmc	200	31	948.176	1133.62	1553.81	0	1553.81	2027.82	2027.82
38	6.20692	12928.7	27.1431	Qmc	200	31	914.937	1093.88	1487.67	0	1487.67	1956.73	1956.73
39	6.20692	12445.2	27.7204	Qmc	200	31	879.075	1051	1416.31	0	1416.31	1878.23	1878.23
40	6.20692	11899.7	28.3008	Qmc	200	31	840.24	1004.57	1339.04	0	1339.04	1791.47	1791.47
41	6.20692	11291	28.8844	Qmc	200	31	798.473	954.638	1255.93	0	1255.93	1696.43	1696.43
42	6.20692	10618.1	29.4712	Qmc	200	31	753.812	901.243	1167.06	0	1167.06	1593.05	1593.05
43	6.20692	9880.04	30.0615	Qmc	200	31	706.297	844.435	1072.52	0	1072.52	1481.31	1481.31
44	6.20692	9075.48	30.6553	Qmc	200	31	655.967	784.261	972.375	0	972.375	1361.17	1361.17
45	6.20692	8192.31	31.2528	Qmc	200	31	602.263	720.054	865.516	0	865.516	1231.02	1231.02
46	6.20692	6962.21	31.8541	Qmc	200	31	530.896	634.729	723.511	0	723.511	1053.38	1053.38
47	6.20692	5540.6	32.4594	Qmc	200	31	450.693	538.839	563.923	0	563.923	850.597	850.597
48	6.20692	4047.29	33.0687	Qmc	200	31	368.267	440.293	399.915	0	399.915	639.699	639.699
49	6.20692	2480.79	33.6823	Qmc	200	31	283.655	339.132	231.554	0	231.554	420.602	420.602
50	6.20692	839.523	34.3003	Qmc	200	31	194.63	232.696	54.4149	0	54.4149	187.184	187.184

D-D' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.94609

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	8.25065	1436.17	-0.111213	Tw	400	31	290.421	565.185	274.915	0	274.915	274.351	274.351
2	8.25065	4247.76	0.675506	Tw	400	31	405.387	788.92	647.271	0	647.271	652.051	652.051
3	8.25065	6939.44	1.44117	Tw	400	31	513.277	998.884	996.71	0	996.71	1009.62	1009.62
4	8.25065	9512.75	2.2071	Tw	400	31	614.3	1195.48	1323.91	0	1323.91	1347.58	1347.58
5	8.25065	11967.6	2.97341	Tw	400	31	708.632	1379.06	1629.43	0	1629.43	1666.24	1666.24
6	8.25065	14303.6	3.74027	Tw	400	31	796.438	1549.94	1913.82	0	1913.82	1965.89	1965.89
7	8.25065	16520.7	4.50779	Tw	400	31	877.883	1708.44	2177.62	0	2177.62	2246.83	2246.83
8	8.25065	18618.4	5.27612	Tw	400	31	953.111	1854.84	2421.26	0	2421.26	2509.28	2509.28
9	8.25065	20596.4	6.04541	Tw	400	31	1022.27	1989.42	2645.25	0	2645.25	2753.52	2753.52
10	8.25065	22454.1	6.81579	Tw	400	31	1085.48	2112.45	2849.99	0	2849.99	2979.73	2979.73
11	8.25065	24191	7.58742	Tw	400	31	1142.88	2224.15	3035.9	0	3035.9	3188.14	3188.14
12	8.25065	26008.8	8.36043	Tw	400	31	1202.25	2339.68	3228.16	0	3228.16	3404.84	3404.84
13	8.25065	28404.8	9.13497	Tw	400	31	1282.14	2495.16	3486.93	0	3486.93	3693.1	3693.1
14	8.25065	30737.4	9.91121	Tw	400	31	1358.16	2643.1	3733.15	0	3733.15	3970.47	3970.47
15	8.25065	32946.3	10.6893	Tw	400	31	1428.17	2779.34	3959.89	0	3959.89	4229.47	4229.47
16	8.25065	35030.6	11.4694	Tw	400	31	1492.27	2904.09	4167.51	0	4167.51	4470.29	4470.29
17	8.25065	36989.2	12.2516	Tw	400	31	1550.57	3017.54	4356.32	0	4356.32	4693.02	4693.02
18	8.25065	38821.1	13.0362	Tw	400	31	1603.15	3119.88	4526.64	0	4526.64	4897.82	4897.82
19	8.25065	40525.2	13.8232	Tw	400	31	1650.12	3211.28	4678.75	0	4678.75	5084.77	5084.77
20	8.25065	42100.1	14.613	Tw	400	31	1691.55	3291.9	4812.93	0	4812.93	5253.96	5253.96
21	8.25065	43544.4	15.4055	Tw	400	31	1727.52	3361.91	4929.44	0	4929.44	5405.46	5405.46
22	8.25065	44856.8	16.2011	Tw	400	31	1758.11	3421.45	5028.53	0	5028.53	5539.35	5539.35
23	8.25065	46035.7	17	Tw	400	31	1783.4	3470.65	5110.42	0	5110.42	5655.65	5655.65
24	8.25065	47079.3	17.8022	Tw	400	31	1803.44	3509.65	5175.33	0	5175.33	5754.42	5754.42
25	8.25065	47985.9	18.6081	Tw	400	31	1818.3	3538.57	5223.46	0	5223.46	5835.67	5835.67
26	8.25065	48751.9	19.4178	Tw	400	31	1827.98	3557.42	5254.83	0	5254.83	5899.2	5899.2
27	8.25065	49172.9	20.2316	Tw	400	31	1825.88	3553.32	5248	0	5248	5920.93	5920.93
28	8.25065	49309.6	21.0497	Tw	400	31	1814.27	3530.74	5210.42	0	5210.42	5908.66	5908.66
29	8.25065	49300.9	21.8722	Tw	400	31	1797.92	3498.91	5157.46	0	5157.46	5879.2	5879.2
30	8.25065	49144.1	22.6996	Tw	400	31	1776.86	3457.93	5089.24	0	5089.24	5832.5	5832.5
31	8.25065	48836.8	23.532	Tw	400	31	1751.14	3407.87	5005.94	0	5005.94	5768.52	5768.52
32	8.25065	48425.2	24.3696	Tw	400	31	1722.34	3351.83	4912.67	0	4912.67	5692.86	5692.86
33	8.25065	47902.8	25.2129	Tw	400	31	1690.34	3289.56	4809.04	0	4809.04	5604.92	5604.92
34	8.25065	47220.6	26.062	Tw	400	31	1653.74	3218.32	4690.48	0	4690.48	5499.28	5499.28
35	8.25065	46375.4	26.9174	Tw	400	31	1612.55	3138.17	4557.08	0	4557.08	5375.79	5375.79
36	8.25065	45363.2	27.7793	Tw	400	31	1566.82	3049.17	4408.95	0	4408.95	5234.32	5234.32
37	8.25065	44180.3	28.6481	Tw	400	31	1516.56	2951.36	4246.18	0	4246.18	5074.69	5074.69
38	8.25065	42956.4	29.5241	Tw	400	31	1465.77	2852.52	4081.69	0	4081.69	4911.79	4911.79
39	8.25065	41992.7	30.4078	Tw	400	31	1423.31	2769.88	3944.14	0	3944.14	4779.44	4779.44
40	8.25065	40879	31.2995	Tw	400	31	1377.02	2679.81	3794.24	0	3794.24	4631.47	4631.47
41	8.25065	38808.2	32.1998	Tw	400	31	1303.93	2537.57	3557.51	0	3557.51	4378.64	4378.64
42	8.25065	35517.4	33.1091	Tw	400	31	1197.47	2330.39	3212.71	0	3212.71	3993.6	3993.6
43	8.25065	32020.2	34.0279	Tw	400	31	1087.22	2115.82	2855.61	0	2855.61	3589.72	3589.72
44	8.25065	28376	34.9568	Tw	400	31	975.032	1897.5	2492.25	0	2492.25	3173.88	3173.88
45	8.25065	24626	35.8963	Tw	400	31	862.19	1677.9	2126.79	0	2126.79	2750.82	2750.82
46	8.25065	20655.7	36.8471	Tw	400	31	745.731	1451.26	1749.59	0	1749.59	2308.43	2308.43
47	8.25065	16454.5	37.8099	Tw	400	31	625.61	1217.49	1360.54	0	1360.54	1845.99	1845.99
48	8.25065	12013.4	38.7854	Tw	400	31	501.855	976.655	959.718	0	959.718	1363.01	1363.01
49	8.25065	7322.45	39.7744	Tw	400	31	374.493	728.798	547.212	0	547.212	858.946	858.946
50	8.25065	2431.33	40.7779	Tw	400	31	251.416	489.277	148.582	0	148.582	365.429	365.429

D-D' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.18635

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	11.2476	2739.2	-1.66702	Tw	400	31	619.189	734.575	556.826	0	556.826	538.805	538.805
2	11.2476	8104.96	-0.882479	Tw	400	31	908.742	1078.09	1128.52	0	1128.52	1114.53	1114.53
3	11.2476	13245.5	-0.0981065	Tw	400	31	1175.62	1394.7	1655.46	0	1655.46	1653.45	1653.45
4	11.2476	18160.8	0.686248	Tw	400	31	1420.96	1685.75	2139.84	0	2139.84	2156.86	2156.86
5	11.2476	22851	1.47073	Tw	400	31	1645.77	1952.46	2583.72	0	2583.72	2625.98	2625.98
6	11.2476	27315.8	2.25549	Tw	400	31	1851.05	2195.99	2989.03	0	2989.03	3061.94	3061.94
7	11.2476	31584.4	3.04067	Tw	400	31	2039.18	2419.18	3360.48	0	3360.48	3468.81	3468.81
8	11.2476	35855.5	3.82643	Tw	400	31	2220.88	2634.74	3719.24	0	3719.24	3867.78	3867.78
9	11.2476	39948.1	4.6129	Tw	400	31	2387.51	2832.42	4048.22	0	4048.22	4240.86	4240.86
10	11.2476	43813.4	5.40025	Tw	400	31	2537.37	3010.21	4344.12	0	4344.12	4583.98	4583.98
11	11.2476	47450.5	6.18862	Tw	400	31	2671.18	3168.95	4608.31	0	4608.31	4897.96	4897.96
12	11.2476	50858.4	6.97817	Tw	400	31	2789.6	3309.44	4842.12	0	4842.12	5183.56	5183.56
13	11.2476	54036.2	7.76906	Tw	400	31	2893.25	3432.41	5046.77	0	5046.77	5441.51	5441.51
14	11.2476	56982.4	8.56144	Tw	400	31	2982.72	3538.55	5223.42	0	5223.42	5672.46	5672.46
15	11.2476	59707	9.35547	Tw	400	31	3059.06	3629.11	5374.13	0	5374.13	5878.12	5878.12
16	11.2476	63269.1	10.1513	Tw	400	31	3169.15	3759.72	5591.51	0	5591.51	6158.95	6158.95
17	11.2476	67300	10.9491	Tw	400	31	3295.47	3909.58	5840.91	0	5840.91	6478.45	6478.45
18	11.2476	71092.9	11.7491	Tw	400	31	3407.21	4042.14	6061.55	0	6061.55	6770.19	6770.19
19	11.2476	74645.9	12.5515	Tw	400	31	3504.88	4158.02	6254.4	0	6254.4	7034.72	7034.72
20	11.2476	77956.8	13.3563	Tw	400	31	3588.97	4257.78	6420.42	0	6420.42	7272.54	7272.54
21	11.2476	81023.2	14.1638	Tw	400	31	3659.92	4341.95	6560.51	0	6560.51	7484.16	7484.16
22	11.2476	83842.6	14.9742	Tw	400	31	3718.16	4411.04	6675.49	0	6675.49	7669.98	7669.98
23	11.2476	86412.3	15.7877	Tw	400	31	3764.09	4465.53	6766.17	0	6766.17	7830.43	7830.43
24	11.2476	88729.2	16.6045	Tw	400	31	3798.09	4505.87	6833.31	0	6833.31	7965.89	7965.89
25	11.2476	90790.3	17.4247	Tw	400	31	3820.53	4532.48	6877.61	0	6877.61	8076.7	8076.7
26	11.2476	92530.2	18.2487	Tw	400	31	3829.43	4543.04	6895.17	0	6895.17	8157.83	8157.83
27	11.2476	93526.1	19.0766	Tw	400	31	3809.79	4519.74	6856.4	0	6856.4	8173.91	8173.91
28	11.2476	94153.8	19.9086	Tw	400	31	3776.49	4480.24	6790.66	0	6790.66	8158.37	8158.37
29	11.2476	94510.5	20.745	Tw	400	31	3733.62	4429.38	6706.01	0	6706.01	8120.18	8120.18
30	11.2476	94636.7	21.5861	Tw	400	31	3683.01	4369.34	6606.09	0	6606.09	8063.26	8063.26
31	11.2476	94607.1	22.4321	Tw	400	31	3627.59	4303.59	6496.66	0	6496.66	7994.22	7994.22
32	11.2476	94299.5	23.2833	Tw	400	31	3563.41	4227.45	6369.94	0	6369.94	7903.36	7903.36
33	11.2476	93701.4	24.14	Tw	400	31	3490.45	4140.9	6225.9	0	6225.9	7790.18	7790.18
34	11.2476	92808.4	25.0025	Tw	400	31	3408.99	4044.25	6065.05	0	6065.05	7654.87	7654.87
35	11.2476	92232.8	25.871	Tw	400	31	3339.31	3961.59	5927.48	0	5927.48	7546.88	7546.88
36	11.2476	91853.8	26.746	Tw	400	31	3277.03	3887.7	5804.51	0	5804.51	7455.98	7455.98
37	11.2476	89356.2	27.6278	Tw	400	31	3148.96	3735.77	5551.64	0	5551.64	7199.83	7199.83
38	11.2476	84999.7	28.5167	Tw	400	31	2966.32	3519.09	5191.03	0	5191.03	6802.74	6802.74
39	11.2476	80408.5	29.4133	Tw	400	31	2781.28	3299.57	4825.7	0	4825.7	6393.72	6393.72
40	11.2476	75691.5	30.3177	Tw	400	31	2597.38	3081.4	4462.59	0	4462.59	5981.46	5981.46
41	11.2476	70632.2	31.2307	Tw	400	31	2408.33	2857.12	4089.34	0	4089.34	5549.64	5549.64
42	11.2476	65212.6	32.1525	Tw	400	31	2214.05	2626.64	3705.75	0	3705.75	5097.45	5097.45
43	11.2476	59439.5	33.0837	Tw	400	31	2015.18	2390.71	3313.1	0	3313.1	4625.96	4625.96
44	11.2476	53600.3	34.025	Tw	400	31	1820.21	2159.41	2928.15	0	2928.15	4157.05	4157.05
45	11.2476	47483	34.9767	Tw	400	31	1623.36	1925.87	2539.47	0	2539.47	3675.17	3675.17
46	11.2476	40956.2	35.9397	Tw	400	31	1421.39	1686.27	2140.71	0	2140.71	3171.13	3171.13
47	11.2476	34005	36.9146	Tw	400	31	1214.47	1440.79	1732.16	0	1732.16	2644.5	2644.5
48	11.2476	26607.7	37.9021	Tw	400	31	1002.59	1189.43	1313.83	0	1313.83	2094.38	2094.38
49	11.2476	17091.2	38.903	Tw	400	31	743.549	882.109	802.364	0	802.364	1402.4	1402.4
50	11.2476	5778.45	39.9183	Tw	400	31	441.489	523.76	205.972	0	205.972	575.353	575.353

Interslice Data

A-A' - Static

Global Minimum Query (spencer) - Safety Factor: 2.41389

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	1047.91	8283.56	0	0	0
2	1054.34	8283.06	761.319	225.153	16.4751
3	1060.77	8282.66	2185.48	646.335	16.4751
4	1067.2	8282.33	4369.97	1292.38	16.4751
5	1074.41	8282.07	8316.84	2459.63	16.4751
6	1081.63	8281.9	13065.5	3864	16.4751
7	1088.84	8281.85	18460	5459.39	16.4751
8	1096.06	8281.9	24219.8	7162.79	16.4751
9	1103.27	8282.05	30053.1	8887.95	16.4751
10	1110.48	8282.31	35887.2	10613.3	16.4751
11	1117.7	8282.67	41656	12319.4	16.4751
12	1124.91	8283.13	47299.6	13988.4	16.4751
13	1132.13	8283.71	52763	15604.2	16.4751
14	1139.34	8284.38	57997	17152.1	16.4751
15	1146.55	8285.17	62959.8	18619.8	16.4751
16	1153.77	8286.06	67664.3	20011.1	16.4751
17	1160.98	8287.06	72082	21317.6	16.4751
18	1168.2	8288.16	76164	22524.8	16.4751
19	1175.41	8289.37	79866.4	23619.8	16.4751
20	1182.63	8290.7	83150	24590.9	16.4751
21	1189.84	8292.13	85980.4	25427.9	16.4751
22	1197.05	8293.68	88327.9	26122.2	16.4751
23	1204.27	8295.33	90167.5	26666.2	16.4751
24	1211.48	8297.1	91478.5	27054	16.4751
25	1218.7	8298.99	92245	27280.6	16.4751
26	1225.91	8300.99	92455.6	27342.9	16.4751
27	1233.12	8303.11	92103.4	27238.8	16.4751
28	1240.34	8305.34	91186.2	26967.5	16.4751
29	1247.55	8307.7	89717.7	26533.2	16.4751
30	1254.77	8310.18	87721.4	25942.8	16.4751
31	1261.98	8312.79	85217.9	25202.4	16.4751
32	1269.2	8315.52	82232.6	24319.6	16.4751
33	1276.41	8318.38	78796.2	23303.3	16.4751
34	1283.62	8321.37	74944.4	22164.1	16.4751
35	1290.84	8324.5	70718.3	20914.3	16.4751
36	1298.05	8327.76	66131.1	19557.7	16.4751
37	1305.27	8331.16	61169.5	18090.3	16.4751
38	1312.48	8334.71	55876	16524.8	16.4751
39	1319.69	8338.4	50300.3	14875.9	16.4751
40	1326.91	8342.24	44498.9	13160.1	16.4751
41	1334.12	8346.24	38535.2	11396.4	16.4751
42	1341.34	8350.39	32480.3	9605.75	16.4751
43	1348.55	8354.71	26413.1	7811.45	16.4751
44	1355.77	8359.19	20454.2	6049.15	16.4751
45	1362.98	8363.85	15001.1	4436.43	16.4751
46	1370.19	8368.68	10266.6	3036.25	16.4751
47	1377.41	8373.71	6408.2	1895.17	16.4751
48	1384.62	8378.92	3579.49	1058.6	16.4751
49	1390.61	8383.4	1430.04	422.923	16.4752
50	1396.6	8388.03	154.899	45.8099	16.4751
51	1402.6	8392.8	0	0	0

A-A' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.37949

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	465.76	8155.71	0	0	0
2	507.334	8154.54	14994.6	5997.86	21.8015
3	546.127	8153.87	50661	20264.4	21.8014
4	584.92	8153.59	97241.3	38896.5	21.8014
5	623.714	8153.71	153700	61480	21.8014
6	662.507	8154.23	216843	86737.3	21.8014
7	701.301	8155.14	284467	113787	21.8014
8	740.094	8156.46	353810	141524	21.8014
9	778.888	8158.17	428638	171455	21.8014
10	817.681	8160.29	509010	203604	21.8014
11	856.475	8162.8	592573	237029	21.8014
12	895.268	8165.72	677078	270831	21.8014
13	934.061	8169.04	761392	304557	21.8014
14	972.855	8172.76	843440	337376	21.8014
15	1011.65	8176.89	920806	368322	21.8014
16	1050.44	8181.42	990926	396370	21.8014
17	1089.24	8186.36	1.0554e+06	422161	21.8015
18	1128.03	8191.7	1.11624e+06	446497	21.8015
19	1166.82	8197.46	1.17117e+06	468469	21.8015
20	1205.62	8203.63	1.22035e+06	488139	21.8014
21	1244.41	8210.22	1.26298e+06	505193	21.8014
22	1283.2	8217.22	1.29809e+06	519236	21.8014
23	1322	8224.64	1.3251e+06	530041	21.8014
24	1360.79	8232.48	1.34356e+06	537423	21.8014
25	1399.58	8240.75	1.35285e+06	541140	21.8014
26	1438.38	8249.45	1.35321e+06	541286	21.8015
27	1477.17	8258.57	1.3451e+06	538041	21.8014
28	1515.96	8268.13	1.32891e+06	531562	21.8013
29	1554.76	8278.12	1.3051e+06	522041	21.8014
30	1593.55	8288.56	1.27409e+06	509636	21.8014
31	1632.34	8299.44	1.23614e+06	494455	21.8014
32	1671.14	8310.77	1.19144e+06	476577	21.8015
33	1709.93	8322.55	1.1406e+06	456239	21.8014
34	1748.72	8334.78	1.08433e+06	433731	21.8014
35	1787.52	8347.48	1.02294e+06	409177	21.8015
36	1826.31	8360.65	956572	382629	21.8014
37	1865.1	8374.28	885501	354201	21.8014
38	1903.9	8388.4	810811	324324	21.8014
39	1942.69	8402.99	733041	293217	21.8014
40	1981.48	8418.08	652546	261019	21.8015
41	2020.28	8433.66	570294	228118	21.8014
42	2059.07	8449.74	486790	194716	21.8014
43	2097.86	8466.33	402753	161101	21.8014
44	2136.66	8483.44	320392	128157	21.8014
45	2175.45	8501.07	242327	96931	21.8015
46	2214.25	8519.24	170827	68330.9	21.8014
47	2253.04	8537.94	109201	43680.5	21.8015
48	2291.83	8557.19	60004.5	24001.8	21.8014
49	2330.63	8577.01	28249.4	11299.8	21.8015
50	2369.42	8597.39	11325.7	4530.27	21.8014
51	2408.21	8618.35	0	0	0

B-B' - Static

Global Minimum Query (spencer) - Safety Factor: 2.21649

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	889.718	8203.15	0	0	0
2	894.533	8202.86	673.076	208.27	17.1936
3	899.348	8202.64	1663.44	514.717	17.1936
4	904.163	8202.48	2922.59	904.337	17.1936
5	908.978	8202.39	4405.33	1363.14	17.1936
6	913.793	8202.37	6069.55	1878.1	17.1936
7	918.608	8202.41	7876.09	2437.1	17.1936
8	923.423	8202.53	9797.79	3031.73	17.1936
9	928.237	8202.71	11842.5	3664.41	17.1936
10	933.052	8202.96	13977.4	4325.03	17.1936
11	937.867	8203.27	16166.4	5002.37	17.1936
12	942.682	8203.66	18375.7	5685.99	17.1936
13	947.497	8204.11	20574.1	6366.23	17.1936
14	952.312	8204.64	22732.5	7034.12	17.1936
15	957.127	8205.23	24824.4	7681.4	17.1936
16	961.942	8205.89	26825.2	8300.51	17.1936
17	966.757	8206.62	28712.6	8884.53	17.1936
18	971.572	8207.42	30466.3	9427.19	17.1936
19	976.387	8208.3	32068.2	9922.85	17.1936
20	981.202	8209.24	33501.9	10366.5	17.1936
21	986.017	8210.26	34753.1	10753.6	17.1936
22	990.832	8211.34	35809.4	11080.5	17.1936
23	995.647	8212.51	36660.5	11343.8	17.1936
24	1000.46	8213.74	37297.6	11541	17.1936
25	1005.28	8215.05	37714.2	11669.9	17.1936
26	1010.09	8216.44	37905.3	11729	17.1936
27	1014.91	8217.9	37867.9	11717.5	17.1937
28	1019.72	8219.44	37601.1	11634.9	17.1936
29	1024.54	8221.06	37105.7	11481.6	17.1936
30	1029.35	8222.77	36384.6	11258.5	17.1937
31	1034.17	8224.55	35442.3	10966.9	17.1936
32	1038.98	8226.41	34285.8	10609.1	17.1937
33	1043.8	8228.36	32923.9	10187.6	17.1936
34	1048.61	8230.4	31367.5	9706.04	17.1936
35	1053.43	8232.52	29629.7	9168.32	17.1936
36	1058.24	8234.73	27726	8579.25	17.1936
37	1063.06	8237.03	25674.1	7944.32	17.1936
38	1067.87	8239.43	23494.1	7269.78	17.1936
39	1072.69	8241.92	21209	6562.69	17.1936
40	1077.5	8244.51	18844.2	5830.94	17.1936
41	1082.32	8247.2	16428	5083.32	17.1936
42	1087.13	8249.99	13992	4329.53	17.1936
43	1091.95	8252.89	11572.8	3580.97	17.1936
44	1096.76	8255.9	9211.44	2850.29	17.1936
45	1101.58	8259.02	6950.27	2150.62	17.1936
46	1106.39	8262.26	4835.65	1496.3	17.1937
47	1111.2	8265.62	2921.5	903.999	17.1936
48	1116.02	8269.1	1370.3	424.011	17.1936
49	1120.83	8272.71	306.735	94.9128	17.1936
50	1125.65	8276.46	-187.252	-57.9414	17.1936
51	1130.46	8280.35	0	0	0

B-B' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.27222

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	846.201	8191.55	0	0	0
2	855.835	8192.11	2050.47	842.337	22.333
3	865.469	8192.76	4589.34	1885.31	22.333
4	875.103	8193.51	7527.79	3092.43	22.3329
5	884.737	8194.35	10783.2	4429.75	22.3329
6	894.371	8195.28	14278.9	5865.8	22.333
7	904.005	8196.3	17944	7371.43	22.333
8	913.639	8197.42	21713.2	8919.84	22.333
9	923.273	8198.64	25530.9	10488.1	22.3329
10	932.907	8199.94	29421.6	12086.5	22.333
11	942.541	8201.34	33347.5	13699.2	22.3329
12	952.175	8202.84	37240.9	15298.6	22.3329
13	961.809	8204.43	41039.8	16859.2	22.3329
14	971.443	8206.12	44686.8	18357.4	22.3329
15	981.077	8207.91	48130	19771.9	22.333
16	990.711	8209.79	51322	21083.2	22.333
17	1000.35	8211.77	54220.2	22273.8	22.333
18	1009.98	8213.84	56786.7	23328.1	22.333
19	1019.61	8216.02	58988.2	24232.4	22.3329
20	1029.25	8218.3	60795.6	24974.9	22.3329
21	1038.88	8220.67	62184.4	25545.4	22.3329
22	1048.52	8223.15	63134.4	25935.7	22.3329
23	1058.15	8225.73	63629.7	26139.2	22.333
24	1067.78	8228.41	63658.3	26151	22.333
25	1077.42	8231.19	63212.7	25967.9	22.333
26	1087.05	8234.08	62289.3	25588.5	22.3329
27	1096.68	8237.07	60890.7	25014	22.3329
28	1106.32	8240.17	59025.2	24247.6	22.3329
29	1115.95	8243.38	56733.1	23306.1	22.333
30	1125.59	8246.69	54177.7	22256.3	22.3329
31	1135.22	8250.11	51430	21127.5	22.3329
32	1144.85	8253.65	48538.1	19939.5	22.3329
33	1154.49	8257.29	45477.6	18682.3	22.333
34	1164.12	8261.05	42284	17370.3	22.3329
35	1173.76	8264.93	38992.9	16018.3	22.3329
36	1183.39	8268.92	35568.1	14611.4	22.3329
37	1193.02	8273.02	32045.7	13164.4	22.3329
38	1202.66	8277.25	28476.9	11698.3	22.3328
39	1212.29	8281.59	24916.9	10235.9	22.3329
40	1221.93	8286.06	21425.5	8801.65	22.333
41	1231.56	8290.65	18066.8	7421.86	22.3329
42	1241.19	8295.37	14864.6	6106.39	22.3329
43	1250.83	8300.22	11781.3	4839.78	22.3329
44	1260.46	8305.19	8877.73	3646.99	22.333
45	1270.1	8310.3	6223.53	2556.64	22.333
46	1279.73	8315.54	3893.45	1599.44	22.333
47	1289.36	8320.92	1967.44	808.227	22.3329
48	1299	8326.44	531.354	218.281	22.3329
49	1308.63	8332.1	-288.122	-118.361	22.3329
50	1318.27	8337.91	-369.957	-151.979	22.3329
51	1327.9	8343.86	0	0	0

C-C' - Static

Global Minimum Query (spencer) - Safety Factor: 1.94263

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	1191.43	8441.39	0	0	0
2	1195.13	8441.52	500.02	184.986	20.3023
3	1198.82	8441.7	1159.6	429.003	20.3023
4	1202.52	8441.92	1957.5	724.192	20.3023
5	1206.22	8442.19	2869.82	1061.71	20.3023
6	1209.92	8442.51	3874.12	1433.26	20.3023
7	1213.61	8442.88	4949.34	1831.05	20.3024
8	1217.31	8443.3	6075.75	2247.77	20.3023
9	1221.01	8443.76	7234.91	2676.61	20.3023
10	1224.7	8444.27	8409.62	3111.21	20.3024
11	1228.4	8444.83	9583.89	3545.64	20.3024
12	1232.1	8445.44	10742.9	3974.42	20.3023
13	1235.79	8446.1	11872.9	4392.48	20.3024
14	1239.49	8446.81	12961.3	4795.15	20.3024
15	1243.19	8447.57	13996.7	5178.18	20.3023
16	1246.89	8448.38	14968.4	5537.68	20.3024
17	1250.58	8449.24	15867.1	5870.16	20.3024
18	1254.28	8450.15	16684.3	6172.5	20.3024
19	1257.98	8451.11	17412.6	6441.95	20.3024
20	1261.67	8452.12	18045.6	6676.11	20.3023
21	1265.37	8453.19	18577.7	6872.96	20.3023
22	1269.07	8454.31	19004.4	7030.84	20.3024
23	1272.76	8455.48	19322.3	7148.44	20.3024
24	1276.46	8456.71	19528.7	7224.8	20.3024
25	1280.16	8458	19622.1	7259.34	20.3023
26	1283.86	8459.34	19601.4	7251.71	20.3024
27	1287.55	8460.74	19465.2	7201.29	20.3023
28	1291.25	8462.19	19213.4	7108.15	20.3024
29	1294.95	8463.71	18847.4	6972.76	20.3024
30	1298.64	8465.28	18369.6	6795.99	20.3024
31	1303.72	8467.54	17538	6488.34	20.3024
32	1307.48	8469.29	16797.4	6214.35	20.3024
33	1311.24	8471.11	15957.7	5903.69	20.3024
34	1315	8473	15026.5	5559.18	20.3024
35	1318.76	8474.95	14012.7	5184.11	20.3024
36	1322.52	8476.97	12926.4	4782.24	20.3024
37	1326.27	8479.07	11779.4	4357.89	20.3024
38	1330.03	8481.24	10584.7	3915.88	20.3023
39	1333.79	8483.48	9356.86	3461.65	20.3024
40	1337.55	8485.81	8112.26	3001.2	20.3024
41	1341.31	8488.21	6868.87	2541.2	20.3024
42	1345.07	8490.7	5646.54	2088.99	20.3024
43	1348.83	8493.27	4467.09	1652.64	20.3024
44	1352.59	8495.93	3354.44	1241	20.3023
45	1356.35	8498.68	2334.81	863.784	20.3024
46	1360.11	8501.53	1436.87	531.583	20.3024
47	1363.87	8504.47	691.967	255.999	20.3024
48	1367.62	8507.51	134.355	49.7056	20.3023
49	1371.38	8510.67	-198.51	-73.4402	20.3023
50	1375.14	8513.93	-265.655	-98.2811	20.3023
51	1378.9	8517.3	0	0	0

C-C' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.19558

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	1096.98	8409.11	0	0	0
2	1103.19	8409.89	1270.84	575.374	24.3587
3	1109.4	8410.73	2691.89	1218.76	24.3588
4	1115.61	8411.62	4231.46	1915.8	24.3587
5	1121.82	8412.58	5859.67	2652.98	24.3588
6	1128.03	8413.59	7548.79	3417.73	24.3587
7	1134.24	8414.66	9273.15	4198.44	24.3587
8	1140.45	8415.78	11009.1	4984.39	24.3587
9	1146.67	8416.97	12734.9	5765.74	24.3587
10	1152.88	8418.21	14430.7	6533.53	24.3587
11	1159.09	8419.52	16078.5	7279.61	24.3588
12	1165.3	8420.88	17662.3	7996.67	24.3588
13	1171.51	8422.3	19167.6	8678.19	24.3588
14	1177.72	8423.79	20581.8	9318.46	24.3588
15	1183.93	8425.33	21893.8	9912.5	24.3588
16	1190.14	8426.94	23094.5	10456.1	24.3588
17	1196.35	8428.6	24176.1	10945.8	24.3588
18	1202.56	8430.33	25130	11377.7	24.3588
19	1208.77	8432.12	25946.4	11747.3	24.3588
20	1214.98	8433.97	26617	12050.9	24.3587
21	1221.19	8435.89	27135.4	12285.6	24.3587
22	1227.4	8437.87	27496.6	12449.2	24.3588
23	1233.61	8439.92	27697.4	12540.1	24.3588
24	1239.82	8442.03	27735.9	12557.5	24.3588
25	1246.04	8444.2	27612	12501.4	24.3588
26	1252.25	8446.45	27327.1	12372.4	24.3587
27	1258.46	8448.76	26884.2	12171.9	24.3588
28	1264.67	8451.13	26287.8	11901.9	24.3588
29	1270.88	8453.58	25543.9	11565.1	24.3588
30	1277.09	8456.1	24660.2	11165	24.3588
31	1283.3	8458.68	23645.4	10705.5	24.3587
32	1289.51	8461.34	22498.3	10186.2	24.3588
33	1295.72	8464.07	21224.7	9609.56	24.3588
34	1301.93	8466.87	19836.5	8981.03	24.3588
35	1308.14	8469.75	18347	8306.67	24.3588
36	1314.35	8472.7	16771.5	7593.33	24.3587
37	1320.56	8475.72	15126.5	6848.58	24.3588
38	1326.93	8478.91	13386.2	6060.66	24.3588
39	1333.14	8482.09	11660.3	5279.24	24.3588
40	1339.35	8485.35	9926.31	4494.17	24.3588
41	1345.56	8488.7	8207.98	3716.18	24.3587
42	1351.76	8492.12	6530.92	2956.89	24.3588
43	1357.97	8495.63	4922.63	2228.74	24.3588
44	1364.18	8499.22	3412.54	1545.04	24.3588
45	1370.38	8502.9	2032.05	920.017	24.3588
46	1376.59	8506.67	817.676	370.205	24.3588
47	1382.8	8510.52	-115.445	-52.2681	24.3588
48	1389	8514.47	-688.708	-311.814	24.3587
49	1395.21	8518.51	-854.762	-386.996	24.3588
50	1401.42	8522.65	-563.886	-255.301	24.3588
51	1407.62	8526.88	0	0	0

D-D' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.94609

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	1154.27	8299.76	0	0	0
2	1162.52	8299.74	2400.5	835.364	19.1877
3	1170.77	8299.84	5682.14	1977.36	19.1877
4	1179.02	8300.05	9710	3379.05	19.1877
5	1187.27	8300.36	14357.3	4996.27	19.1876
6	1195.52	8300.79	19505.5	6787.83	19.1877
7	1203.77	8301.33	25044.2	8715.28	19.1877
8	1212.02	8301.98	30870.6	10742.9	19.1878
9	1220.27	8302.74	36889.4	12837.4	19.1877
10	1228.52	8303.62	43012.1	14968.1	19.1878
11	1236.77	8304.6	49157.3	17106.6	19.1878
12	1245.02	8305.7	55250	19226.8	19.1877
13	1253.28	8306.92	61254.8	21316.4	19.1877
14	1261.53	8308.24	67206.9	23387.7	19.1877
15	1269.78	8309.68	73030.4	25414.3	19.1877
16	1278.03	8311.24	78646.3	27368.6	19.1877
17	1286.28	8312.91	83981.7	29225.3	19.1877
18	1294.53	8314.71	88969.6	30961.1	19.1877
19	1302.78	8316.62	93549	32554.7	19.1877
20	1311.03	8318.65	97664.9	33987	19.1877
21	1319.28	8320.8	101268	35240.8	19.1877
22	1327.53	8323.07	104313	36300.7	19.1878
23	1335.78	8325.47	106764	37153.5	19.1877
24	1344.03	8327.99	108587	37787.9	19.1877
25	1352.28	8330.64	109755	38194.3	19.1877
26	1360.53	8333.42	110246	38365.2	19.1877
27	1368.78	8336.33	110045	38295.1	19.1876
28	1377.04	8339.37	109151	37984	19.1876
29	1385.29	8342.54	107574	37435.4	19.1877
30	1393.54	8345.86	105326	36653	19.1877
31	1401.79	8349.31	102421	35642.2	19.1877
32	1410.04	8352.9	98882.8	34410.9	19.1877
33	1418.29	8356.64	94732.3	32966.5	19.1877
34	1426.54	8360.52	89996.5	31318.5	19.1877
35	1434.79	8364.56	84713.6	29480	19.1877
36	1443.04	8368.75	78928.5	27466.8	19.1877
37	1451.29	8373.09	72692.9	25296.9	19.1877
38	1459.54	8377.6	66066	22990.7	19.1877
39	1467.79	8382.27	59087.3	20562.1	19.1877
40	1476.04	8387.11	51732.1	18002.6	19.1877
41	1484.29	8392.13	44059.7	15332.6	19.1877
42	1492.54	8397.33	36334	12644.1	19.1877
43	1500.79	8402.71	28928	10066.8	19.1876
44	1509.05	8408.28	21989.4	7652.24	19.1877
45	1517.3	8414.05	15658.8	5449.2	19.1877
46	1525.55	8420.02	10071.8	3504.94	19.1877
47	1533.8	8426.2	5406.89	1881.58	19.1877
48	1542.05	8432.6	1858.08	646.605	19.1877
49	1550.3	8439.23	-364.538	-126.858	19.1877
50	1558.55	8446.1	-1033.04	-359.494	19.1877
51	1566.8	8453.22	0	0	0

D-D' - Seismic

Global Minimum Query (spencer) - Safety Factor: 1.18635

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	1080.47	8277.32	0	0	0
2	1091.72	8276.99	6599.29	3510.58	28.0113
3	1102.97	8276.82	15367.1	8174.73	28.0113
4	1114.21	8276.8	25917.4	13787.1	28.0113
5	1125.46	8276.94	37897.2	20159.9	28.0113
6	1136.71	8277.23	50984	27121.7	28.0114
7	1147.96	8277.67	64884.1	34516	28.0114
8	1159.2	8278.27	79338.9	42205.4	28.0113
9	1170.45	8279.02	94169	50094.5	28.0114
10	1181.7	8279.93	109155	58066.7	28.0114
11	1192.95	8280.99	124087	66009.7	28.0113
12	1204.19	8282.21	138773	73822.4	28.0114
13	1215.44	8283.59	153044	81414	28.0114
14	1226.69	8285.12	166748	88704	28.0114
15	1237.94	8286.81	179751	95621.1	28.0114
16	1249.19	8288.67	191937	102104	28.0115
17	1260.43	8290.68	203326	108162	28.0113
18	1271.68	8292.86	213856	113763	28.0112
19	1282.93	8295.2	223390	118836	28.0115
20	1294.18	8297.7	231810	123314	28.0113
21	1305.42	8300.37	239008	127144	28.0114
22	1316.67	8303.21	244896	130276	28.0114
23	1327.92	8306.22	249396	132670	28.0114
24	1339.17	8309.4	252448	134293	28.0113
25	1350.41	8312.75	254002	135120	28.0114
26	1361.66	8316.28	254022	135131	28.0114
27	1372.91	8319.99	252490	134316	28.0114
28	1384.16	8323.88	249433	132689	28.0113
29	1395.4	8327.95	244878	130266	28.0113
30	1406.65	8332.21	238858	127064	28.0114
31	1417.9	8336.66	231412	123103	28.0114
32	1429.15	8341.31	222579	118404	28.0114
33	1440.39	8346.15	212421	113000	28.0113
34	1451.64	8351.19	201011	106931	28.0115
35	1462.89	8356.43	188437	100242	28.0114
36	1474.14	8361.89	174679	92922.7	28.0113
37	1485.38	8367.56	159726	84968.4	28.0113
38	1496.63	8373.44	144064	76637	28.0114
39	1507.88	8379.55	128204	68199.8	28.0113
40	1519.13	8385.89	112330	59755.5	28.0114
41	1530.38	8392.47	96606.9	51391.4	28.0114
42	1541.62	8399.29	81261	43227.9	28.0114
43	1552.87	8406.36	66535.4	35394.4	28.0113
44	1564.12	8413.69	52684	28026	28.0114
45	1575.37	8421.28	39883.9	21216.8	28.0114
46	1586.61	8429.15	28382.5	15098.5	28.0114
47	1597.86	8437.31	18482	9831.75	28.0113
48	1609.11	8445.76	10505.6	5588.6	28.0114
49	1620.36	8454.51	4801.64	2554.3	28.0114
50	1631.6	8463.59	2367.7	1259.53	28.0113
51	1642.85	8473	0	0	0

Discharge Sections

Entity Information

A-A'

Shared Entities

Type	Coordinates (x,y)
External Boundary	2887.45, 8618.45 2829.94, 8619.99 2702.79, 8624.53 2658.07, 8624.51 2626.02, 8625.3 2600.7, 8625.61 2582.31, 8624.17 2570.48, 8625.23 2517.85, 8624.21 2443.38, 8620.87 2402.98, 8617.97 2355.8, 8609.09 2342.68, 8606.44 2328.03, 8603.06 2291.1, 8595.8 2258.69, 8595.19 2255.09, 8593.6 2248, 8590.88 2235.45, 8588.88 2185.92, 8579.54 2150.11, 8571.02 2098.63, 8558.42 2014.25, 8532.81 1925.56, 8507.61 1924.98, 8507.44 1891.45, 8498.78 1856.29, 8489.93 1808.54, 8476.37 1748.12, 8460.45 1703.81, 8450.37 1702.31, 8450.02 1648.26, 8437.75 1646.7, 8437.4 1610.66, 8429.93 1595.57, 8425.9 1563.05, 8420.26 1534.97, 8414.86 1523.24, 8412.02 1515.44, 8411.24 1442.81, 8398.67 1389.57, 8390.9 1352.77, 8383.58 1336.73, 8377.61 1291.81, 8360.89

	1240.05, 8345.58 1144.83, 8313.24 1089.42, 8299.46 1073.81, 8292.49 1053.08, 8283.95 1048, 8283.55 1028.51, 8284.27 983.422, 8278.34 955.213, 8272.35 914.358, 8261.98 868.556, 8248.7 819.931, 8235.39 759.664, 8216.25 717.785, 8204.15 709.451, 8204.15 685.755, 8200.95 597.914, 8184.57 581.288, 8178.91 573.657, 8178.77 529.934, 8169.74 492.208, 8160.51 476.813, 8157.59 453.633, 8153.65 428.481, 8150.33 407.062, 8145.14 389.16, 8140.96 347.617, 8134.26 318.354, 8129.55 285.782, 8125.47 262.165, 8125.14 244.62, 8127.21 202.72, 8134.19 193.1, 8134.31 174.595, 8137.25 173.563, 8137.4 155.281, 8140.05 95.4349, 8144.19 23.7653, 8152.13 0, 8153.19 0, 8030 2956.41, 8030 2956.41, 8615.36
Material Boundary	1703.81, 8450.37 1749.72, 8450.1 1764.67, 8452.09 1800.81, 8457.98 1859.68, 8468.67 1893.25, 8480.69 1916.15, 8490.13 1925.56, 8507.61
Material Boundary	1352.77, 8383.58 1374.2, 8378.55 1425.11, 8380.34 1505.55, 8391.96 1591.68, 8405.26 1615.77, 8413.51 1648.26, 8437.75

Material Boundary	173.563, 8137.4 186.947, 8129.92 205.311, 8124.1 233.593, 8117.65 245.031, 8113.12 256.037, 8110.09 267.324, 8109.05 283.786, 8109.28 307.974, 8113.63 327.754, 8118.62 355.474, 8126.1 412.377, 8135.91 464.832, 8145.27 540.201, 8161.71 569.769, 8165.92 598.692, 8173.01 617.347, 8177.74 703.777, 8192.62 713.19, 8193.01 726.351, 8195.93 752.997, 8202.59 819.169, 8223.03 889.914, 8241.66 945.582, 8258.81 987.394, 8268.75 1017.72, 8273.25 1032.55, 8274.35 1049.7, 8273.09 1056.6, 8275.47 1063.6, 8278.75 1069.81, 8284.93 1073.81, 8292.49

B-B'

Shared Entities

Type	Coordinates (x,y)

External Boundary	3188.38, 8535.7 3125.74, 8544.55 2962.44, 8563.54 2792.51, 8579.55 2689.03, 8588.08 2548.82, 8594.27 2402.48, 8593.27 2329.02, 8584.4 2254.14, 8577.31 2230.97, 8572.34 2175.44, 8557.41 2104.28, 8531.28 2065.87, 8515.9 2047.76, 8511.17 1974.32, 8495.51 1953.12, 8486.69 1897.82, 8469.3 1893.58, 8468.11 1848.59, 8455.43 1739.88, 8427.96 1675.37, 8413.13 1572.45, 8391.4 1468.43, 8374.87 1467.06, 8374.59 1435.61, 8368.19 1384.36, 8357.03 1320.8, 8342.21 1297.65, 8333.9 1233.79, 8309.87 1168.29, 8289.11 1140.23, 8282.06 1110.23, 8276.8 1087.29, 8269.01 1018.69, 8245.3 920.782, 8211.44 846.105, 8191.52 832.877, 8188 819.096, 8184.84 779.923, 8175.86 694.468, 8162.27 604.818, 8151.42 556.523, 8149.85 519.39, 8150.03 488.731, 8155.68 487.592, 8155.84 466.653, 8158.77 386.24, 8170.02 337.255, 8174.17 262.868, 8175.29 154.041, 8175.49 79.6508, 8173.85 35.4292, 8171.36 0, 8164.74 0, 8040 3234.8, 8040 3234.8, 8524.35

Material Boundary	1893.58, 8468.11 1920.58, 8469.11 1975.29, 8477.35 2013.17, 8486.94 2074.79, 8500.94 2088.24, 8510.36 2104.28, 8531.28
Material Boundary	846.105, 8191.52 859.533, 8185.49 877.818, 8182.72 890.745, 8182.04 931.272, 8186.33 984.309, 8197.96 1049.02, 8220.32 1138.47, 8249.91 1189.8, 8271.6 1235.89, 8290.77 1363.68, 8332.57 1417.68, 8351.24 1467.06, 8374.59
Material Boundary	487.592, 8155.84 499.46, 8140.09 509.014, 8131.83 523.867, 8124.77 537.355, 8123.17 559.77, 8125.19 575.807, 8129.93 599.293, 8136.87 632.345, 8142.94 685.753, 8150.45 777.959, 8165.8 798.929, 8171.35 819.096, 8184.84

C-C'

Shared Entities

Type	Coordinates (x,y)

External Boundary	2427.69, 8532.07 2236.19, 8546.84 1997.37, 8559.39 1737.61, 8567.69 1636.9, 8568.09 1576.71, 8565.5 1539.34, 8561.71 1495.36, 8552.66 1445.69, 8537.51 1420.56, 8530.75 1413.58, 8528.87 1375.16, 8516.05 1281.74, 8476.94 1193.47, 8442.09 1096.98, 8409.11 1026.87, 8387.63 848.633, 8341.47 776.706, 8321.97 682.332, 8299.98 596.747, 8280.04 516.267, 8257.29 467.607, 8248.52 419.606, 8236.1 356.714, 8218.25 313.771, 8209.43 291.865, 8203.49 291.654, 8203.43 248.062, 8191.95 207.562, 8184.08 175.014, 8179.45 142.19, 8169.78 101.41, 8157.61 68.1294, 8151.4 43.2685, 8149.75 0, 8150.93 0, 8050 305.73, 8050 952.64, 8050 2578.68, 8050 2578.68, 8519.84
Material Boundary	291.654, 8203.43 311.44, 8198.11 326.411, 8194.08 366.926, 8198.85 427.327, 8210.35 458.121, 8218.63 551.945, 8246.7 668.12, 8276.82 862.997, 8328.86 1012.85, 8364.28 1085.11, 8382.97 1194.71, 8418.97 1308.14, 8469.51 1379.75, 8505.31 1420.56, 8530.75

Material Boundary	305.73, 8050 377.351, 8095.58 465.212, 8124.84 591.347, 8166.85 722.557, 8190.76 808.222, 8180.18 887.547, 8119.03 952.64, 8050

D-D'

Shared Entities

Type	Coordinates (x,y)
External Boundary	2673.59, 8391.86 2583.87, 8400.4 2422.64, 8419.16 2253.59, 8437.05 2119.8, 8450.2 2029.16, 8460.3 1924.57, 8468.89 1819.2, 8475.28 1762.02, 8478.31 1713.86, 8479.23 1670.48, 8476.7 1619.68, 8469.9 1560.98, 8451.38 1510.36, 8436.81 1484.92, 8429.98 1462.31, 8419.32 1409.87, 8398.19 1367.98, 8381.76 1247.92, 8329.97 1154.27, 8299.76 1055.03, 8269.59 999.775, 8258.09 893.664, 8237.77 832.042, 8228.41 796.859, 8221.39 736.509, 8208.72 643.927, 8180.48 593.012, 8166.56 522.102, 8145.22 416.953, 8113.67 337.229, 8087.94 299.968, 8076.45 253.074, 8067.46 194.224, 8059.4 188.449, 8058.61 145.245, 8052.49 73.7076, 8041.07 0, 8034.93 0, 8017.64 0, 7930 468.955, 7930 1540.74, 7930 2790.38, 7930 2790.38, 8380.65

Material Boundary	468.955, 7930 540.328, 7948.82 616.209, 7963.84 677.977, 7983.75 735.452, 7993.13 804.947, 7978.5 875.944, 7968.36 961.058, 7978.04 1038.81, 8019.45 1107.17, 8055.86 1161.69, 8060.65 1222.13, 8060.09 1293.81, 8041.13 1349.31, 8008.83 1413.87, 7982.1 1540.74, 7930
Material Boundary	0, 8017.64 11.3191, 8017.91 36.676, 8019.52 91.3988, 8026.69 126.246, 8032.56 165.182, 8044.07 194.224, 8059.4